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MANAGEMENT AND MAINTENANCE

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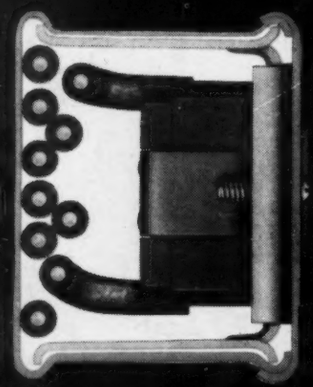

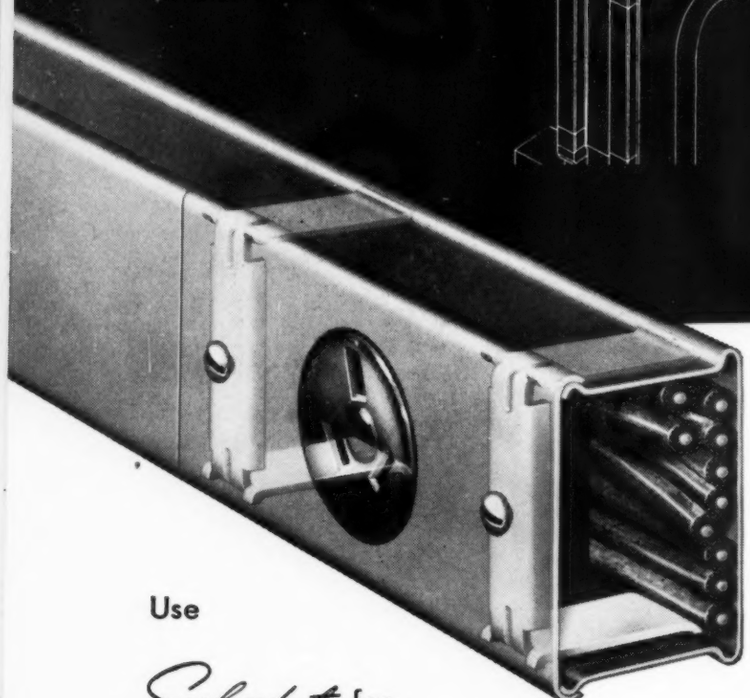

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Factory Management and Maintenance is a consolidation of Factory and Industrial Management (including "Factory") and Maintenance Engineering. Price 35¢ a copy. Publication office, 99-129 N. Broadway, Albany, N. Y. Address communications about subscriptions to J. E. Blackburn, Jr., Director of Circulation, 99-129 N. Broadway, Albany, N. Y., or 330 W. 42nd St., New York 18, N. Y. Subscription rates—United States, U. S. Possessions: $3, 1 year; $4, 2 years; $5, 3 years. Canada: $4, 1 year; $6, 2 years; $8, 3 years. Pan-American countries: $6, 1 year; $10, 2 years; $12, 3 years. Other countries: $15. 1 year; $25, 2 years; $30, 3 years. Please indicate position and company connection on all subscription orders. Cable address, "McGraw-Hill, New York." Member A.B.P., Member A.B.C.

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Factory Management and Maintenance, August, 1946, Vol. 104, No. 8. Published monthly, McGraw-Hill Publishing Co., Inc. Editorial, executive and circulation offices, 330 West 42nd Street, New York 18, N. Y. Entered as second class matter, November 13, 1936, at Post Office, Albany, N. Y., under the Act of March 3, 1879.

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production • maintenance • labor management

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FACTORY
MANAGEMENT AND MAINTENANCE
L. C. MORROW, EDITOR

ECONOMIC UNDERSTANDING IS GROWING

Progress is being made toward a fuller understanding of what the American economy is, what it does, and how it does it.

It seems to me that, to reach this conclusion, one has only to recall (without nostalgia, I hope) the days of NRA. If ever this country has come close to planned economy—which the Russians call by another name—those were the days.

However, it is not necessary to depend entirely upon that experience of a decade ago for purposes of comparison. Since then we have weathered the world's greatest war and, in doing so, reached heights of production that we ourselves did not know we were capable of.

We have carried on, with pretty fair maintenance of living standards, despite anti-industry propaganda, lopsided labor laws, and Administrations that seem not to have had any very clear idea of what makes the American system tick in fields other than political.

We have disproved the predictions of great unemployment to follow V-J Day made by some of the highest federal officers and labor leaders in the land. And we are now in the process of proving, by the lessening of price controls, that in a competitive economy the law of supply and demand still operates if given a chance; and operates to **lower** prices and **raise** standards of living when monkey wrenches are kept out of the machinery.

These are straws, to be sure, but that they point as they do is encouraging. There are other straws, too, that are worth looking at:

FACTORY's worker surveys bring out some comforting truths: Workers don't blindly believe everything they are told by organized labor leaders. They think for themselves, and are receptive to influence from more than one source. On many important matters they think more like management than labor leaders.

Some union leaders seem to be getting on the beam. Witness William Green's tribute to the need for increased output per man-hour of work, Morris Muster's resignation from the furniture workers' union in protest against Communism; Emil Rieve's assertion that "the time is past when the big unions can be operated as private clubs without consideration of public opinion."

Management, too, provides some straws. Individually and collectively its members are taking more interest than ever in trying to find out **in advance** of worker demands what workers want and ought to have, and to provide those things. They are working hard, too, to learn how to give employees the information about the company and the national economy that they ought to have.

And politically some progress seems to have been made. The Case Bill was passed, which indicated courage. Unfortunately, there was not enough courage to pass it over the veto. The OPA bill was passed, in spite of an obstinate administrator backed up by an equally obstinate President. Again courage was lacking to override the veto. But these actions of Congress indicate that maybe some day something will be done.

I am no Pollyanna in my own estimation and that of my close friends. So I find myself a little surprised that I can set down so many hopeful items. I think they will stand up under scrutiny, though, and so offer them in support of my contention that economic progress is being made.

L C Morrow

WHY OUTPUT PER M

1946

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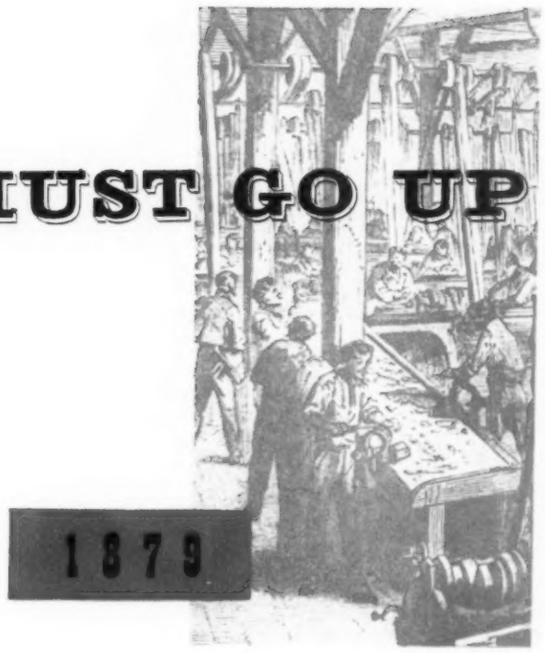
R MAN-HOUR MUST GO UP

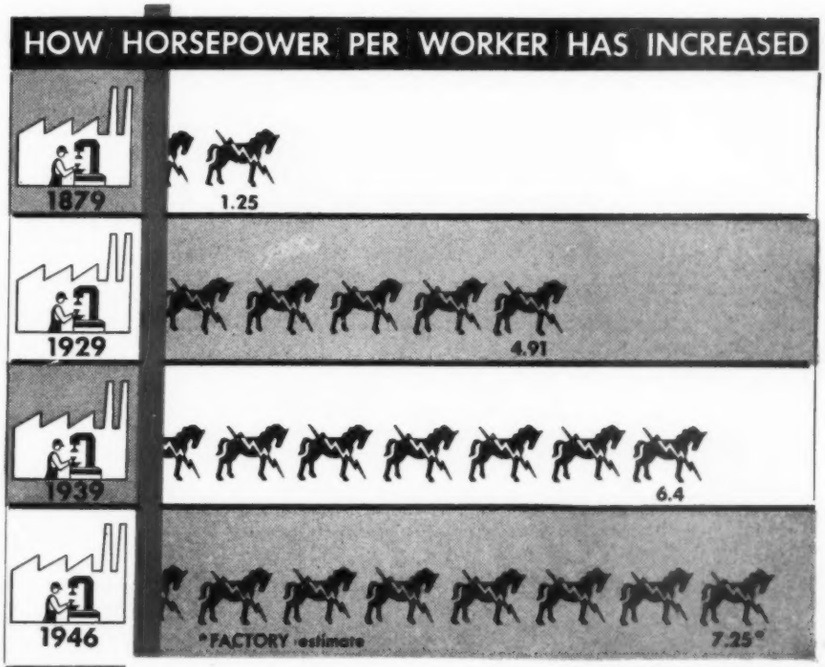


STATISTICS IN TEXT AND CHARTS ACCOMPANYING THIS ARTICLE ARE FROM GOVERNMENT SOURCES, NATIONAL INDUSTRIAL CONFERENCE BOARD, AND McGRAW-HILL DEPARTMENT OF ECONOMICS

In the United States, people at first lived in a kind of hand-to-mouth existence. Many of them worked from 12 to 18 hours a day. They had to work a good many hours because they couldn't turn out a great deal of anything with the poor tools and machines they had. They needed power machines on which to do the work instead of doing it by hand.

As the years went on they got more and more power equipment. The power used in making things in factories went up from 1.25 horsepower per worker in 1879 to 4.91 in 1929—nearly quadrupled in 50 years. It is estimated to be now about 7.25, almost six times what it was in 1879.

This increasing power has enabled factories to produce more and more things per hour of work per man, which means they have increased "output per man-hour."



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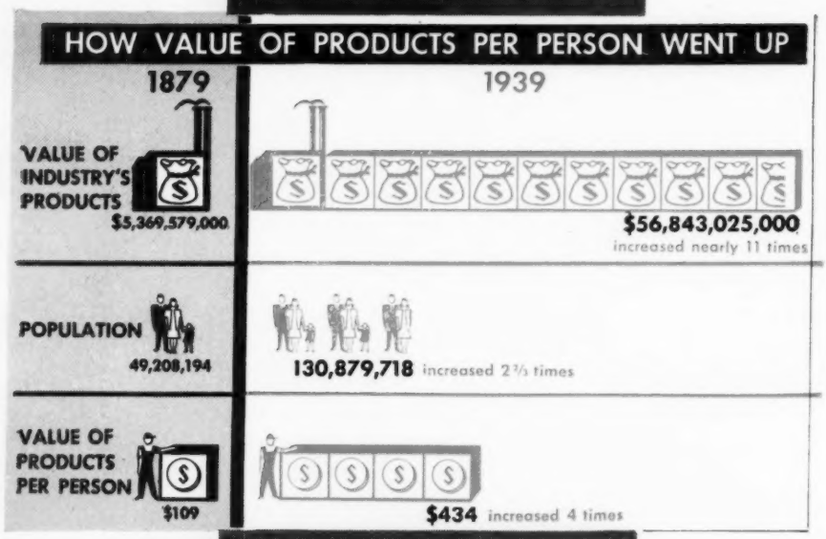
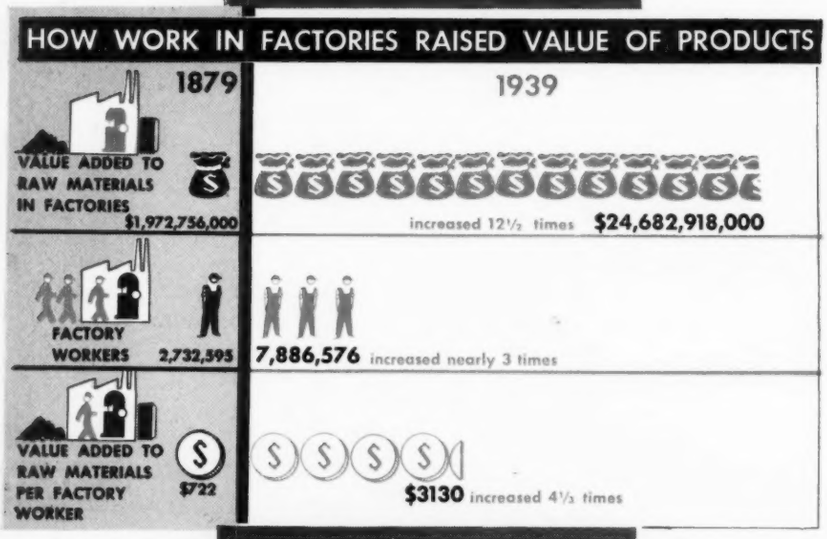


Population increased, too, so more people needed more things. The horsepower used in factories to operate more power equipment increased much more rapidly than the population. This meant that, even though there were many more people, each one could have more of the things that factories made.

Actually, in 1879 the factories turned out $5,370,000,000 worth of goods for 49,000,000 people. In 1939 they turned out $57,000,000,000 worth for 131,000,000 people. That meant $109 worth per person in 1879, and $434 worth in 1939.

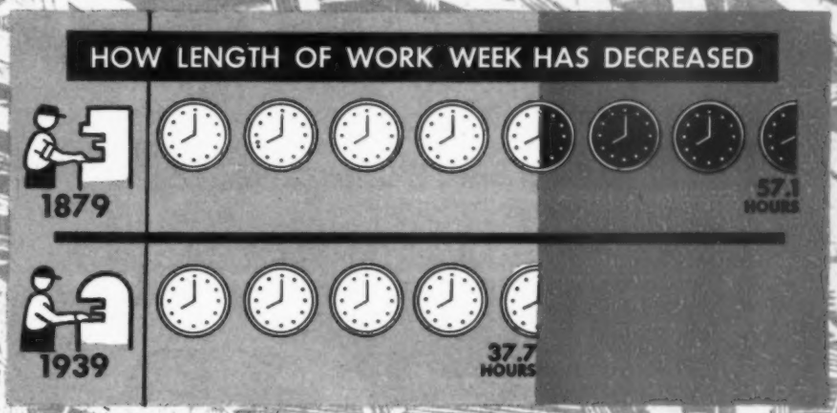


It was work done in factories that counted in providing more things for people. The raw materials on which the factories did their work were worth little before being converted into useful things. When each person could have more of the things made by industry, it meant that the value added to raw materials in factories had gone up. In 1879, the value added to raw materials in factories per factory worker was $722. In 1939, it was $3130.

The increased power, by which workers in factories were enabled to make more things, and increase the value added to raw materials, was not a gift from the gods. Somebody had to pay for it. The people themselves—some of them—did. The money came from savings.

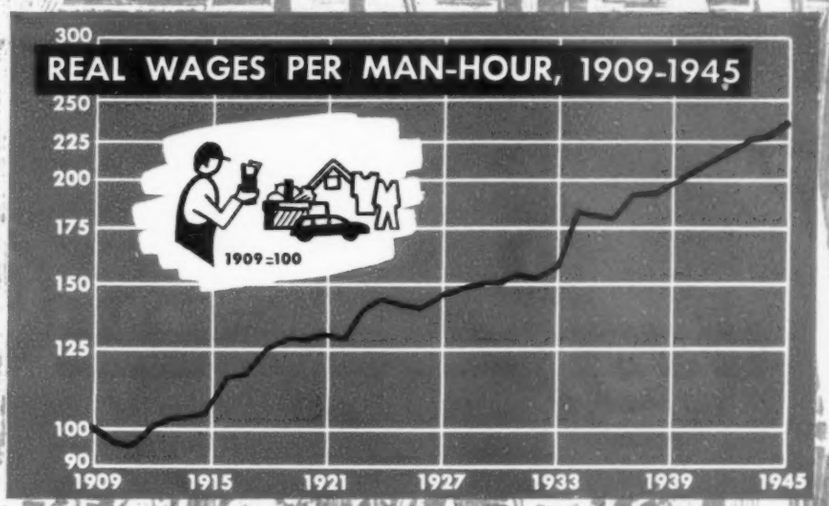
In 1879, the money invested in plant and equipment was $1082 per worker; in 1939 it was $6134. Payment for the use of this money—interest—had to come out of increased output per man-hour of work; otherwise there was no use building the plants and putting in the equipment.

Twelve hours per day—and more—was a long time to work. The greater and greater use of power permitted the gradual reduction of these long hours. In 1879, hours per week averaged 57.1. In 1939, they averaged 37.7.



How did the worker himself fare, other than by getting shorter hours?

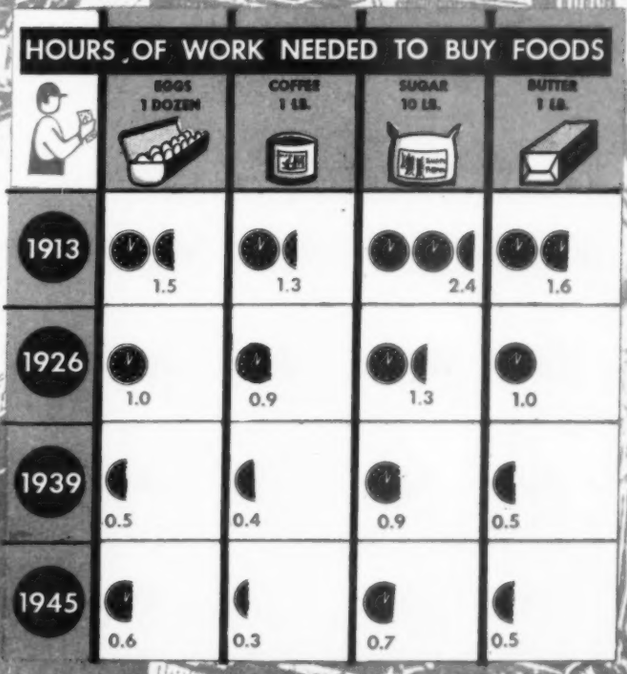
During the time when the output per man-hour rose 2.6 times (1909-1939), the purchasing power of wages almost exactly doubled. The chart shows the steady increase as the years went by.



It is a matter of history that, as a rule, the purchasing power of wages goes up and down as the output per man-hour of work goes up and down.

Some of the happy results for the worker of increasing output per man-hour of work have been figured out by the National Industrial Conference Board in a very practical fashion. The figures go back only to 1913, but they are also right up to date, 1945. These figures show the hours of work in factories required to purchase a dozen eggs, a pound of coffee, a pound of butter, 10 pounds of sugar.

It is evident that the factory worker benefited directly from increased output per man-hour along with all the other parts of the population.



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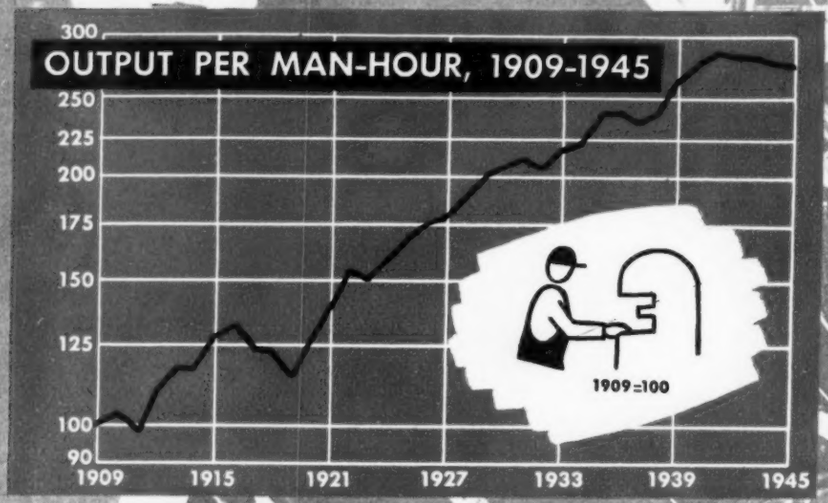
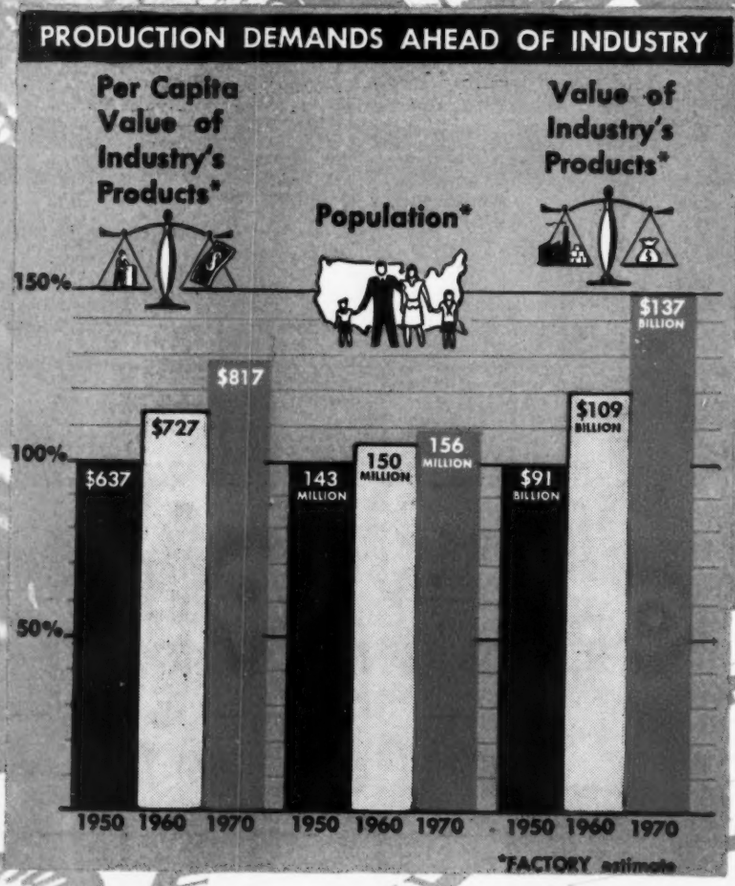


Output per man-hour of work, as said before, actually increased 2.6 times during the 30 years from 1909 to 1939. The figures are those of the U. S. Department of Labor. It is too bad that figures back to 1879 are not available. However, we do have the figures for horsepower per worker back that far, and can do a little estimating.

We find that in the period from 1909 to 1939 an increase in horsepower per worker of 2.3 times was accompanied by an increase in output per hour per worker of 2.6 times. And we know that the increase in horsepower per worker from 1879 to 1909 was 2.3 times. So it wouldn't seem likely to be too much out of the way if we concluded that like changes in horsepower would mean like changes in output. On that basis the increase in output per man-hour from 1879 to 1909 was 2.6 times. The chart shows only the known figures.

What will happen from now on, as population gets even bigger, and people want their standard of living to keep on going up? Suppose we look ahead by 10-year jumps. The predictions are that population in 1950 will be about 143,000,000; in 1960, about 150,000,000; and so on.

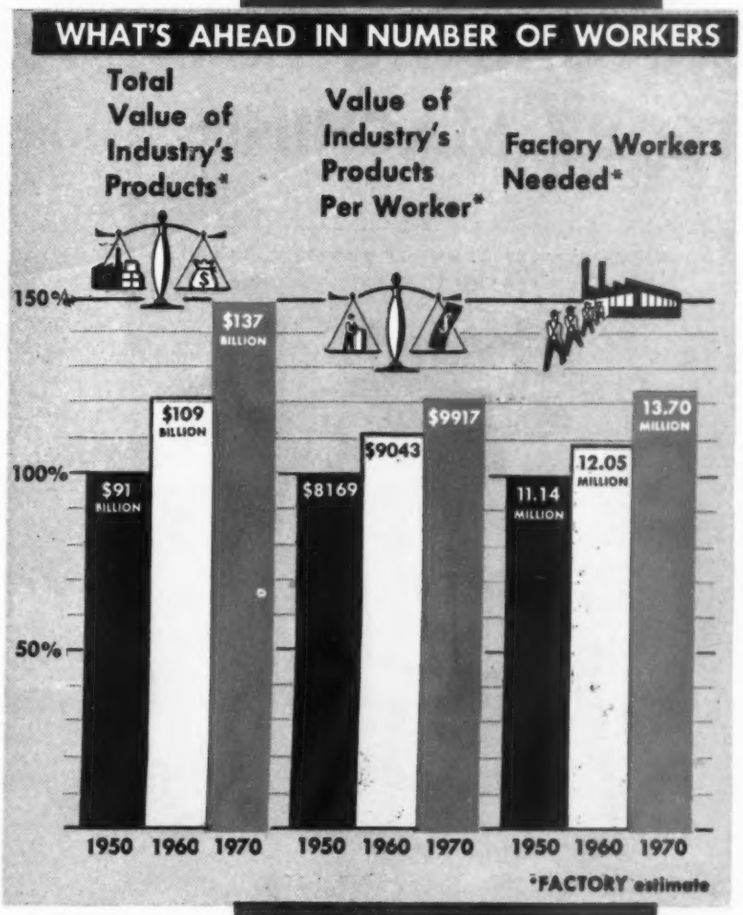
During the 50 years from 1879 to 1929 (the period of industry's normal growth), the average increase per person per year in value of products turned out by factories was $9. For a population of 143,000,000 in 1950, with the same rate of increase in value of products per person, it would be necessary for the factories to turn out $91,000,000,000 worth of goods. Figuring still higher populations in later years, and still higher standards of living, we get a striking picture.



When the average value of factory products per person was $109, in 1879, there were 2,733,000 workers getting wages in those factories. The value of product per worker was $1965 per year. When the value of product per person was $434 in 1939, there were 7,887,000 factory workers, which meant that the value of product per worker was $7208 per year.

The difference is $87.40 per year for the 60-year period. If that difference is maintained, the value of factory products per worker, as time goes on, and the number of workers required, to

step up the standard of living, which is represented by the value of factory products for each person of the total population, would be as shown.



But the number of workers in factories at its highest in non-war years was only 6.7 percent of the population. If that percentage is to hold, there never will be enough workers to do the job visualized here (see lower chart).

On top of that, everybody hopes to work a shorter week and, if we do, the problem will be even harder to solve.

Just what the figures of the future will turn out to be, no one knows. But one very comforting conclusion can be made. It is that by becoming more efficient in our factories we are not going to work ourselves out of jobs. We can go ahead safely to increased output per man-hour of work.

In fact, it looks as though that process is our only salvation, if we are to have the higher standard of living for everybody that we are sure we want.

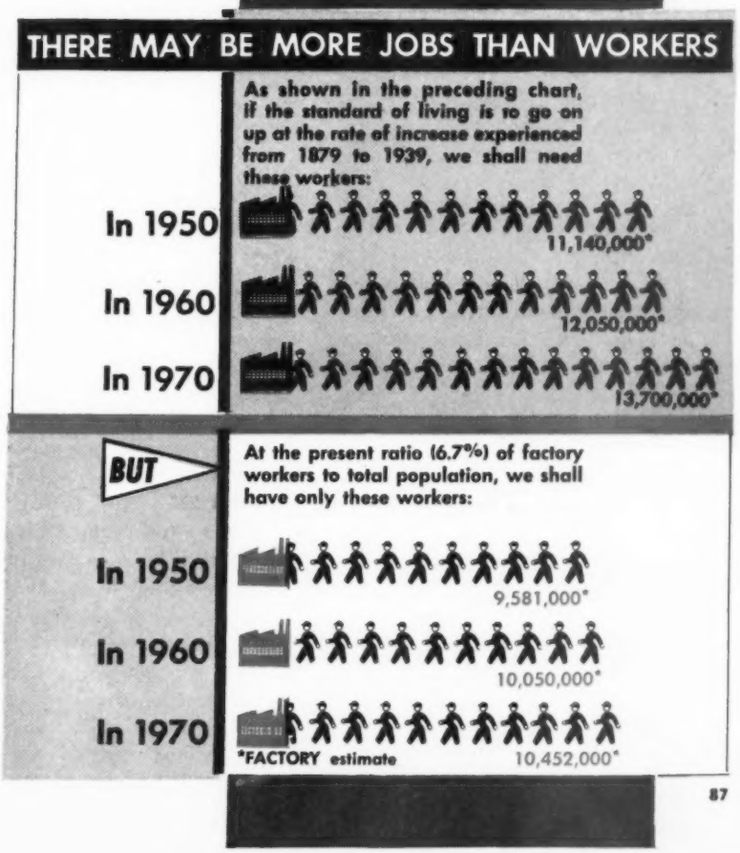
There is another matter of certainty that is pleasing to all of us: *The increases in output per man-hour are not going to come out of ever greater physical exertion of workers.* The net results that could be expected from that source would be puny. The great increases in output per man-hour will come about as a result of technological improvements, as they have in the past. That means more productive machines, better methods, increased use of power.

If that is true, why do we talk of output per man-hour, as though we look to the workers for all the increases? Why not output per machine-hour, or factory-hour?

The answer is that all men are just about alike, while machines and factories differ greatly. The output per man-hour is a stable and convenient measuring device.

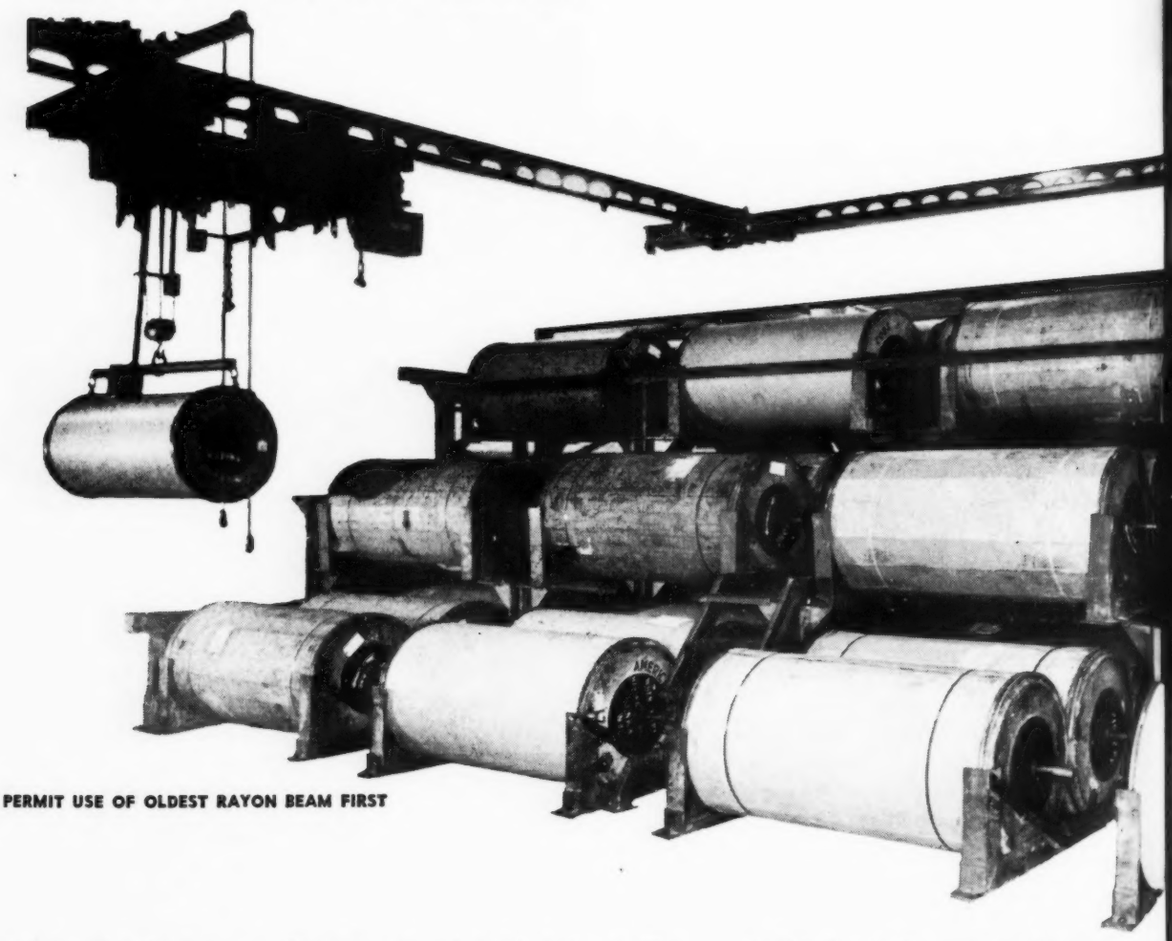
But the greater contribution by power and the machine does not free the worker of responsibility. It is upon him that the effectiveness of the machine depends. What he produces by his own unaided effort may be insignificant; what he can produce in cooperation with the machine is great.

It is upon this dual output per man-hour of work that the welfare of the nation depends. That is why output per man-hour must go up.


THERE MAY BE MORE JOBS THAN WORKERS
As shown in the preceding chart, if the standard of living is to go on up at the rate of increase experienced from 1879 to 1939, we shall need these workers:
In 1950
11,140,000*
In 1960
12,050,000*
In 1970
13,700,000*
BUT
At the present ratio (6.7%) of factory workers to total population, we shall have only these workers:
In 1950
9,581,000*
In 1960
10,050,000*
In 1970
10,452,000*
*FACTORY estimate

AUTOMATIC TRAMRAIL DELIVERY TO 87 MACHINES

E. L. JOHNSON • ASSISTANT INDUSTRIAL RELATIONS MANAGER, UNITED STATES RUBBER COMPANY, SCOTTSVILLE, VA.



SLOPING RACKS PERMIT USE OF OLDEST RAYON BEAM FIRST

One man does what used to be a two-man handling job. Does it at 75 percent saving in man-hours. That is the accomplishment made possible by combining inclined storage racks with an automatic tramrail delivery system in the Scottsville, Va., textile mill where United States Rubber Company processes rayon for use as tire cord.

Storage racks were erected with a ¼-in. pitch per foot, making it possible to handle the 1000-lb. beams of rayon in the order in which they are received. In this way the oldest beam is always the first to be picked up.

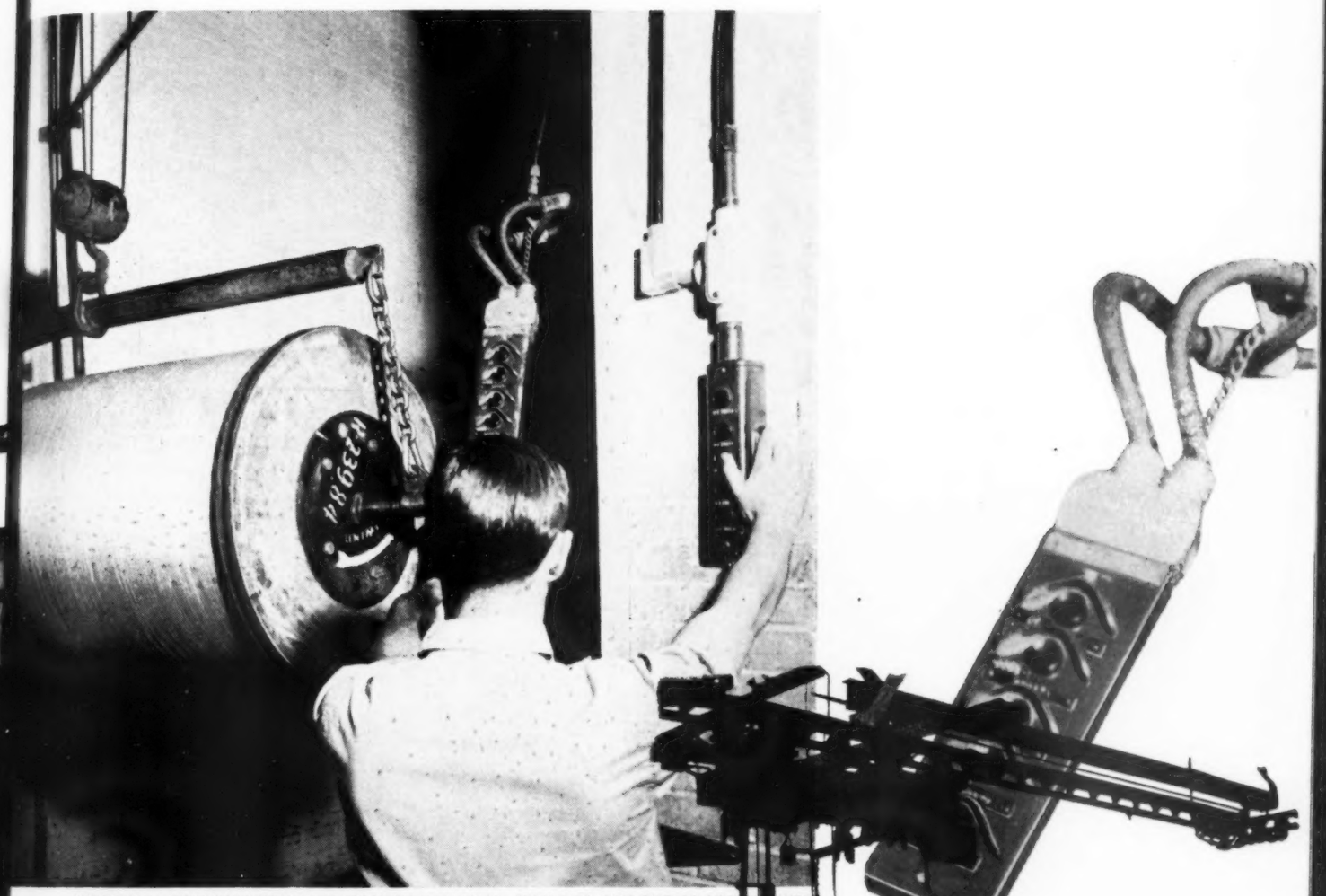
The tramrail conveyor system is composed of three electrical units. One unit acts as the locomotive power; the other two units operate the two hoists. One hoist carries the full beam of rayon from storage rack to ply twisters. The other hoist picks up the empty beam and returns it to storage.

The travel system is designed so that the operator in the storage room can set the course of this conveyor to deliver a beam to any one of the 87 twisting machines. Tracks over each of the machine sections are designated by numbers 1-5, and each frame is numbered 1-22. Should the operator wish to deliver a full beam of rayon to frame 13 on track 3, he presses the pushbutton, selects track 3, and turns a dial to indicate frame 13.

With the system thus set, the load is started on its way by pressing the forward travel button. The conveyor then moves to the selected frame and automatically stops over the empty beam.

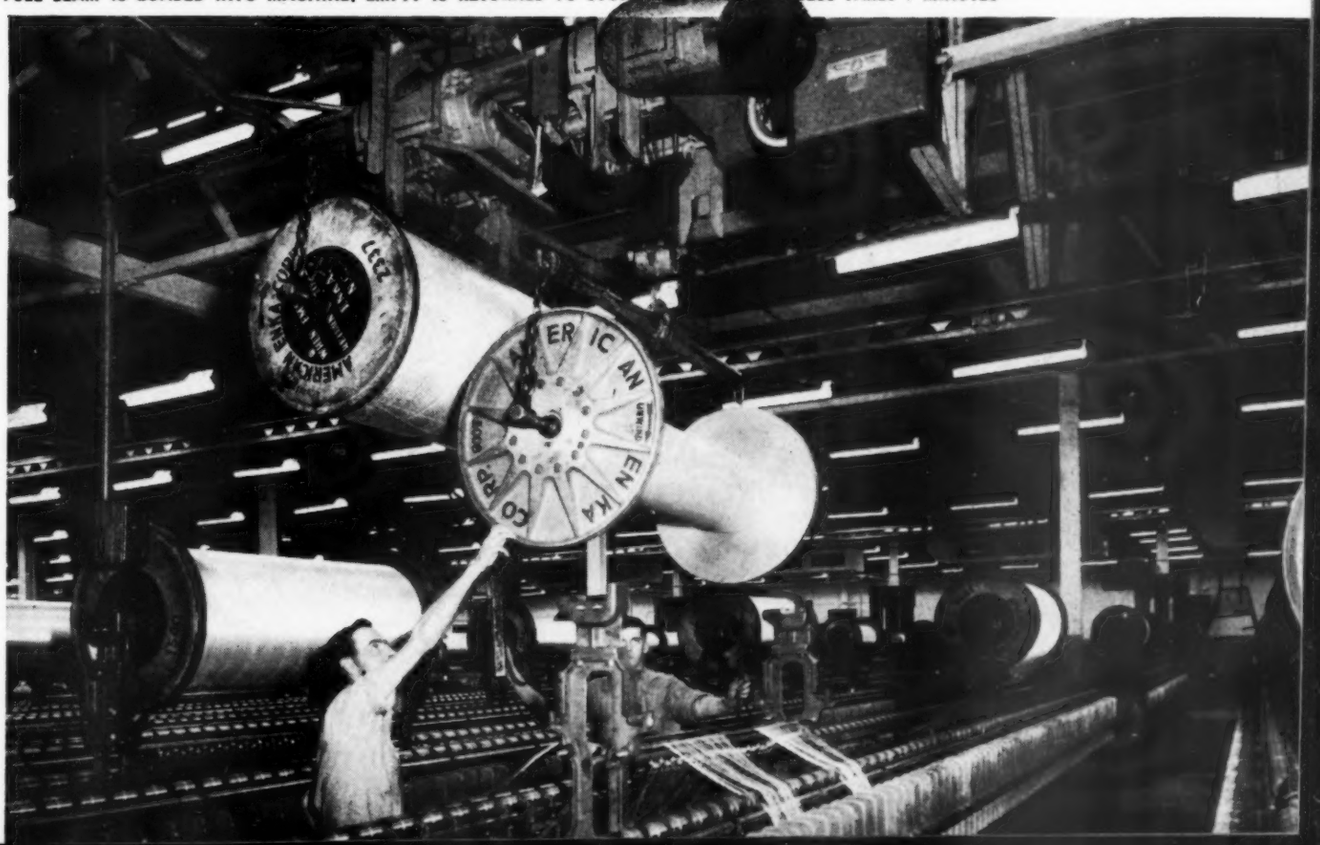
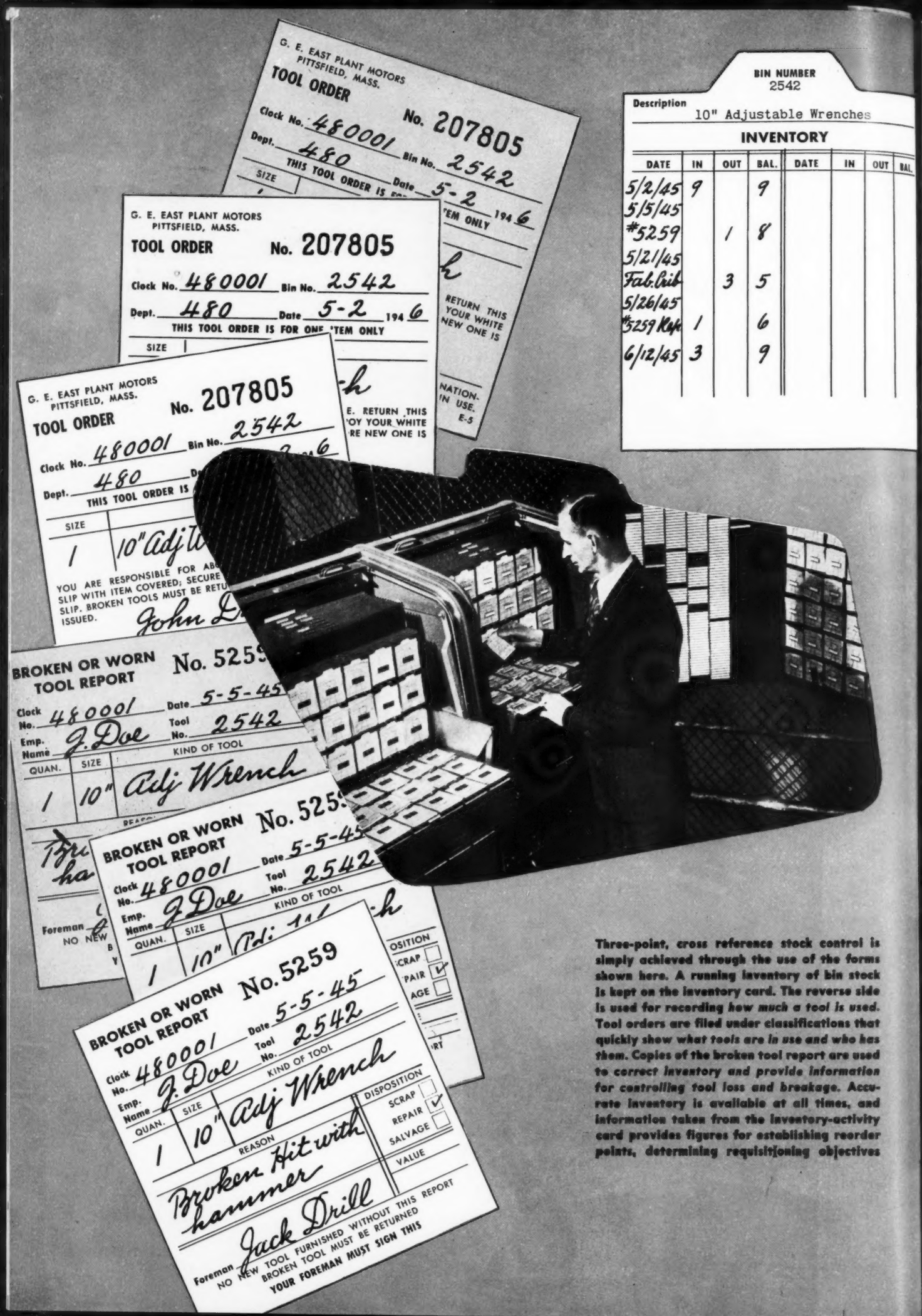
At this frame, the operator, by pushing a button, lifts off the empty beam. This then brings into play the forward inch button and reverse inch button. These buttons are used to jockey the hoist with the full load into position so that the beam may be lowered on the beam stand. Now the conveyor with the empty beam is ready to be sent back to storage. Racks for empty beams are constructed with a reverse incline so that empty beams roll to the shipping door.

The whole operation of picking up the full beam of rayon, delivering it, and returning the empty beam can be accomplished in 7 minutes. Time required to do this operation manually with a hand-propelled beam truck operated by two men, was 15 minutes.



AUTOMATIC CONTROLS REGULATE DELIVERY OF 1000-LB. BEAMS TO ANY ONE OF 87 MACHINES

FULL BEAM IS LOADED INTO MACHINE; EMPTY IS RETURNED TO STORAGE. ENTIRE PROCESS TAKES 7 MINUTES



Three-point, cross reference stock control is simply achieved through the use of the forms shown here. A running inventory of bin stock is kept on the inventory card. The reverse side is used for recording *how much a tool is used.* Tool orders are filed under classifications that quickly show *what tools are in use and who has them.* Copies of the broken tool report are used to *correct inventory and provide information for controlling tool loss and breakage.* Accurate inventory is available at all times, and information taken from the inventory-activity card provides figures for establishing reorder points, determining requisitioning objectives

FLEXIBLE TOOL CONTROL REPAYS COSTS MANY TIMES OVER

CHARLES W. REAGAN • TOOLS AND METHODS, EAST PLANT MOTOR DIVISION, GENERAL ELECTRIC COMPANY PITTSFIELD, MASS.

Complete over-all tool stock control under a compact, flexible system. That's the picture at the East Plant Motor Division of General Electric's Pittsfield Apparatus Works.

Through the use of this system, tool requirements have been reduced to a minimum, inventory loss has been held to a fraction of 1 percent, over a 3-year period, and a method of accurately estimating requirements of manufacturing sections has been provided.

The backbone of the system is in the toolcrib itself. Each tool in the crib is located in a bin according to type and size. Each bin is usually numbered with a 4-digit number. This number, in addition to identifying the tool, indicates its exact location in the following manner:

1st digit—shelf section number.
2nd digit—section division number.
3rd digit—division shelf number.
4th digit—shelf bin number.

It can be readily seen from the above that number 3746 would locate a tool in the third section of shelving, in the seventh division of that section, on the fourth shelf of that division, and in the sixth bin on that shelf.

Tool orders are made in triplicate and the bin number is noted on the order. The original copy is filed under the clock number of the operator, who retains the duplicate, and the third copy is filed by tool number on top of the tool inventory and activity card. Thus a complete knowledge of the location of tools is readily available at all times.

If a certain tool is wanted from the floor, a check of the tool file quickly shows the name and clock number of the operator who has it.

It is also a simple matter to check the number of tools in any operator's possession by referring to the file listing the operators in numerical sequence by clock numbers. Frequent checks of this file and follow-ups tend to discourage the hoarding of tools.

.60 ea

ORDER PT. 6

10'' Adjustable Wrenches #A110

DATE	QUAN.	ORDERED FROM	DATE REC'D	QUAN

INVENTORY

DATE	MAIN CRIB.			FAB. CRIB			SUPPLY BAL.
	IN	OUT	BAL.	IN	OUT	BAL.	

INVENTORY CONTROL IS COMPLETED BY USE OF THIS SIMPLE STOCK RECORD CARD

Included in the control system is an index board that lists every item in the crib alphabetically, with the tool number given beside the item to facilitate the finding of tools by people unfamiliar with the system.

All tools are inspected before they are returned to bins. Those needing repairs or maintenance are sent to the tool service room, and this information is added to the copies of tool orders in the tool file record.

REPORTING BROKEN TOOLS

A lost or broken tool is accounted for on a broken tool report made in triplicate. A new tool cannot be drawn until this report is signed by the operator and countersigned by his foreman. One copy of the report is sent to the tool office for the purpose of comparing the servicability of various types of tools. The foreman concerned gets the second copy. The third copy is filed with the tool records so that the item may be deducted from the inventory figure.

In addition to small tools, all jigs and fixtures are handled under this one control set-up.

A complete set of stock record cards is kept in the tool office. In addition to the usual stock record information, the cards show the "what, when, where" of an item on order. They indicate delivery expectation based on past performance; show tool totals for various departments over a period of time; provide the means of arriving at tool costs for any or all departments; and, most important, give a true picture of inventory at a glance.

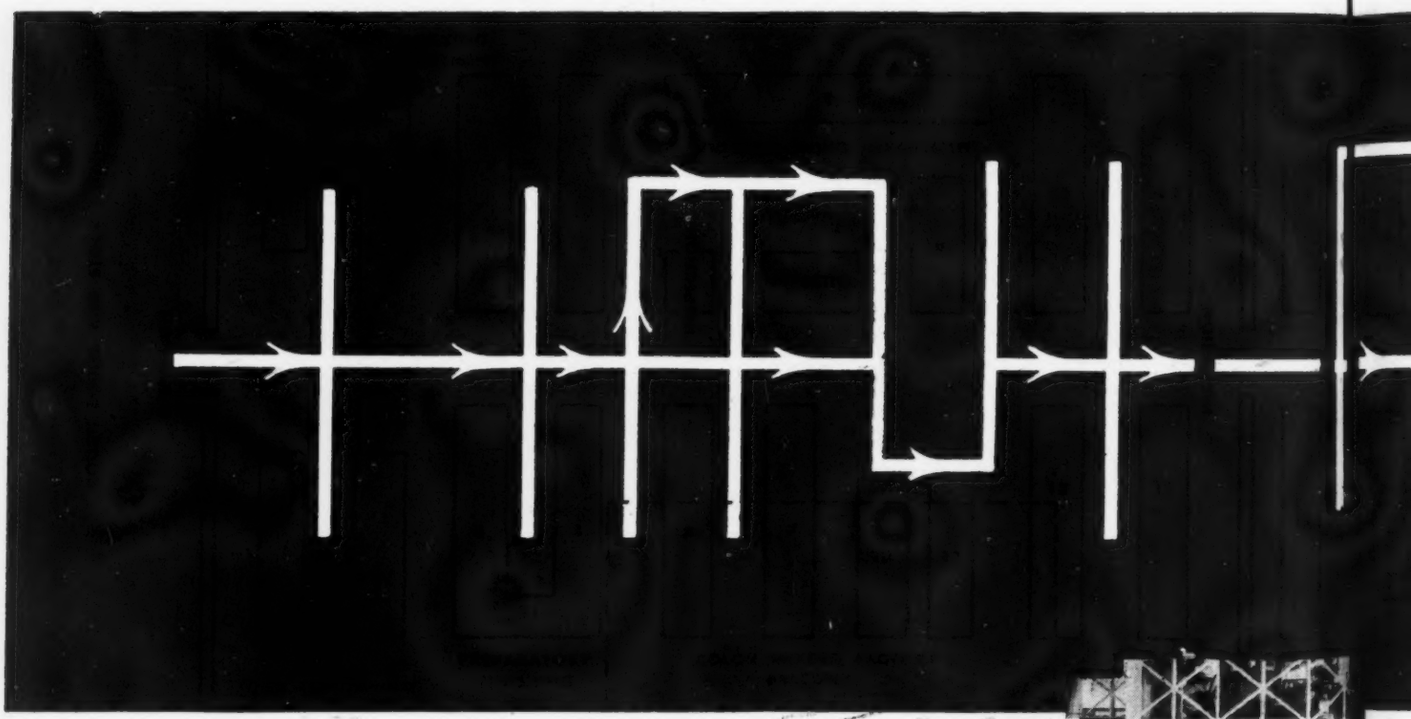
Re-order points, based on information obtained from tool activity cards and from stock records, are established for all items. When a stock record balance reaches this point, additional stock is ordered. The amount is determined by data on the tool activity card.

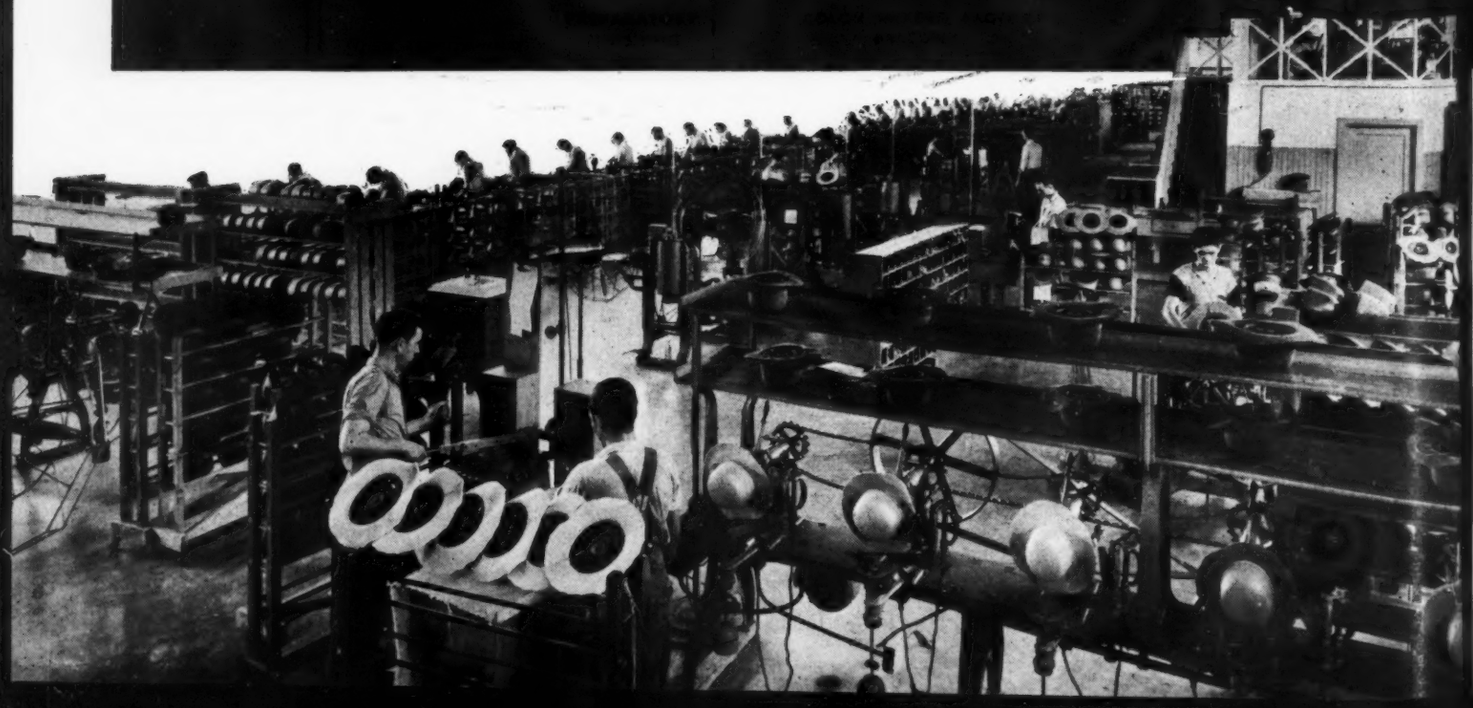
MEN'S HATS IN STRAIGHT-LINE PRODUCTION

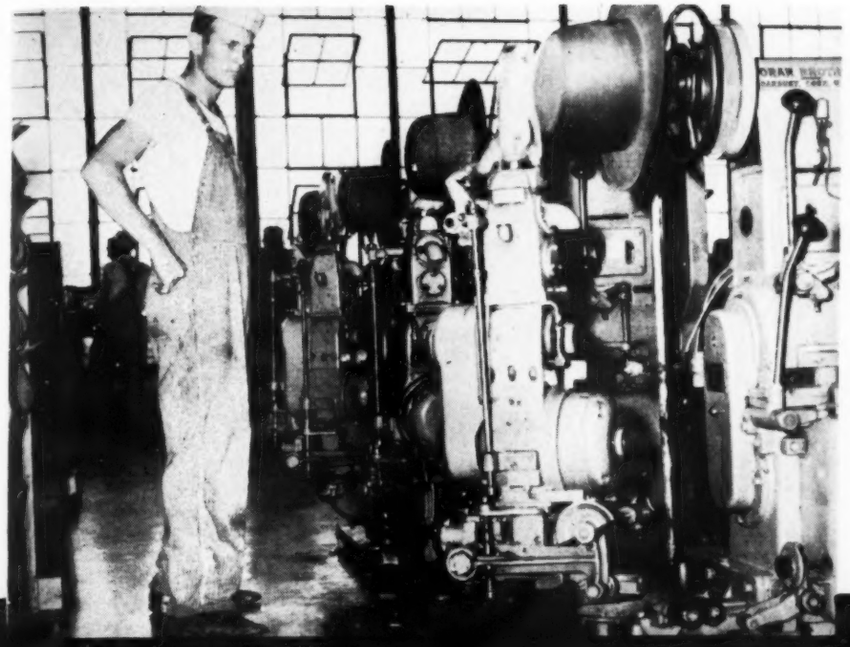
Gone is the old-time "expert hatter" from the modern factory of Byer-Rolnick Company at Garland, Tex. In his place, the skilled operator who does a single job—and does it better than his predecessor. Result: Better hats, fewer rejects, lower costs.

All this has been made possible through strict adherence to the principles of mass manufacture. Hat-making has been broken down into its component operations. And the factory has been laid out so that those operations can be performed in their proper sequence without backtracking.

The flow diagram tells all. Each order emerges from the stockroom with raw bodies and size blocks on a floor rack. As the rack moves down the 500-ft. production floor through the various departments, always in a forward direction, the hats pick up leather, linings, trimmings—are inspected, boxed, chuted to the basement shipping room.

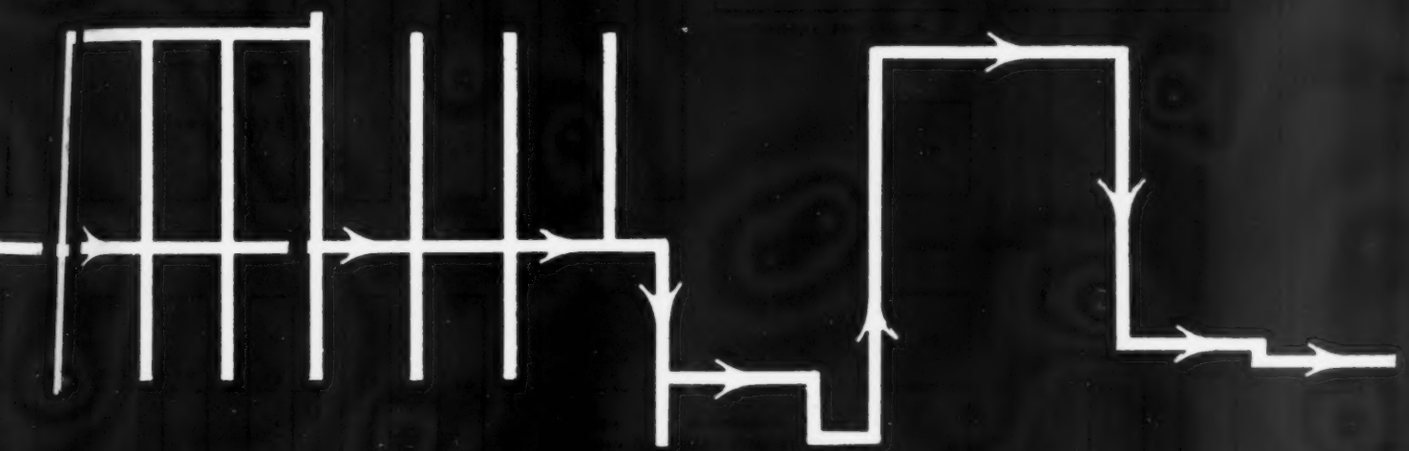






Crown jiggers remove a fine top layer of fur from the raw hat bodies. One man can take care of several machines. Plant floor is kept immaculate at all times. Ducts at strategic points change the air, keep it sweet and clean. It's a good place to work

Below, two of a battery of brim flangers, working together to permit one operator to handle four hats at a time. Full advantage is taken of natural north light, under whose rays defects in the fur stand out sharply. The company believes that this factor alone is responsible for a 30 percent improvement in quality of finished product. Rejections have dropped to something close to the irreducible minimum



LEGEND FOR WORK FLOW

1. Steam blocking
2. Crown ironing
3. Brim blocking
4. Brim jiggers
5. Crown jiggers
6. Brim ragger
7. Crown ragger
8. Finishing line
9. Brim rounding
10. Size and body marking
11. Curling
12. Flanging in
13. Fitting, sewing in leather
14. Banding
15. Lining
16. Binding and snapping
17. Curling
18. Flanging
19. Size check, blocking
20. Final finish

UTILIZING HIGHEST SKILL OF MAINTENANCE PERSONNEL

H. N. JOHNSTON • PLANT ENGINEER, PHILCO CORPORATION PHILADELPHIA

Recent reorganization of the maintenance department at Philco was aimed at the correction of a fallacious custom of subordinating plant maintenance to plant improvements.

Here, as in many other plants, the maintenance department was called upon to do many things other than pure maintenance. For example, Philco's modern mass production techniques required frequent changes in machine layout, with corresponding revisions in other plant services. Also, new plant and service facilities had to be engineered to specific purposes to meet the continual demands of expansion.

Frequently these diversions far outnumbered the strictly maintenance projects. Their nature of close relationship to production schedules obviously required that they be handled without adverse effect upon production. Nor could there be any second guessing in their execution, if production efficiency was to be maintained, hence their handling often became the major function of the maintenance organization.

HIT-OR-MISS UPKEEP

As a result, there was a common tendency to neglect pure maintenance and handle it on a hit-or-miss basis without the serious consideration which it really deserved. Maintenance problems, on the other hand, became increasingly complex in the expanding picture, and multiplied as each new manufacturing unit was put into operation. After all, protection of the investment in buildings and equipment was one of the prime responsibilities of the maintenance organization. But the functions of preventive maintenance and repair were apt to suffer by their relegation to the background in favor of the other type of work.

The problem at Philco centered in how to give each type of work its due. Up to the time of its reorganization, the maintenance department functioned reasonably well as one unit on a craft basis. In fact, such organization is still popular today, and logical enough for purely maintenance operations. But it did not work at Philco because new work usually pushed preventive maintenance aside to the point of jeopardizing proper inspection and repair procedures. A plumber might be doing a repair job today, and be switched over to work on one of the new installations tomorrow.

The apparent solution for the tendency to make preventive maintenance merely a stepchild was the separation of maintenance personnel into two main divisions, each to serve strictly the respective functions of pure maintenance and plant operations. This became the basis for a departmental reorganization that was not the product of a desire to experiment but had been conceived in plan 10 years ago. Then, as conditions changed, improvements in the basic plan were discovered and the skeleton gradually took on flesh.

During the long time between the origin and the application of the system, the maintenance employees were gradually educated in thinking along these same lines in preparation for the change. Therefore, when the new set-up was recently undertaken, it involved merely the application of a philosophy the soundness of which had already been proved to all by the short-comings of the old plan.

These shortcomings are being presented here because they simultaneously afford a measuring stick for revealing the advantages of the new plan. They are as follows:

1. Lack of attention to vital maintenance problems resulted from the continuing presence of "more urgent" problems in the field of production.

2. Too much diversification of effort by maintenance personnel prevented proper engineering and planning both of maintenance and of non-maintenance projects.

3. Firm schedules for many projects could not be established because of the possibility of interruptions, involving the reallocation of manpower to handle breakdowns and clear other pressure points.

4. Because of such interruptions, excessive costs both in maintenance and in non-maintenance work were inevitably experienced.

5. When maintenance and non-maintenance projects were being handled by the same personnel, it was not possible to obtain a clear cost picture for either branch in such close relationship. Present-day accounting methods and the tax situation make such a picture absolutely necessary.

6. Dual responsibilities in some cases and divided responsibilities in other cases sometimes resulted in no delegation of responsibility at all.

The new plan of Philco's maintenance organization, indicated in the chart on the facing page, not only has overcome these major difficulties but also has permitted the utilization of the highest skills of all maintenance personnel to obtain a working efficiency not otherwise obtainable. This applies to all phases of work in the department, whether engineering, administrative, or operating in nature.

Basically, in this plan maintenance functions have been separated from non-maintenance functions by creation of a maintenance department and a plant engineering department, the heads of which report directly to the plant engineer. From the superintendent down through the engineers, foremen, supervisors, and group leaders, and even to the individual craftsman, assignments of personnel to either depart-

philco organization chart

Separate divisions are set up to handle maintenance and plant improvements

plant engineer

MAINTENANCE DEPARTMENT SUPERINTENDENT

MATERIAL SECTION

Foreman
Estimator
Purchase Expediter
Purchase Expediter
Stenographer-Clerk
Stenographer

TOTAL 6

RECEIVING—STORES

SUPERVISOR

TRADE	QUANTITY
Millwright	2
Millwright	3
Helper	1
TOTAL	7

SHIFT B

SUPERVISOR

TRADE	QUANTITY
Toolcrib Attendant	1
Carpenter (Helper)	1
Electrician (Cl. 1)	2
Electrician (Cl. 2)	2
Millwright (Cl. 1)	2
Millwright (Cl. 2)	1
Millwright (Helper)	1
Pipefitter (Gr. Lead.)	1
Pipefitter (Cl. 1)	2
Pipefitter (Cl. 2)	1
Welder (Cl. 2)	1
TOTAL	16

SHIFT C

FOREMAN

TRADE	QUANTITY
Electrician (Gr. Lead.)	1
Electrician (Cl. 1)	1
Electrician (Helper)	4
Millwright (Cl. 1)	1
Millwright (Helper)	1
Pipefitter (Cl. 1)	1
Pipefitter (Cl. 2)	1
Pot Lighter	2
TOTAL	13

OPERATIONS SECTION SHIFT A

FOREMAN
FOREMAN

TRADE	QUANTITY
Oiler	2
Maint. Mach.	2
Laborer	11
Fireman	4
Bricklayer	4
Carpenter (Gr. Lead.)	2
Carpenter (Cl. 1)	1
Carpenter (Cl. 2)	3
Carpenter (Helper)	1
Electrician (Gr. Lead.)	1
Electrician (Cl. 1)	3
Electrician (Helper)	5
Elevator Repairman	2
Millwright (Gr. Lead.)	2
Millwright (Cl. 1)	4
Millwright (Cl. 2)	8
Millwright (Helper)	1
Painter	2
Plumber (Gr. Lead.)	1
Pipefitter (Gr. Lead.)	2
Pipefitter (Cl. 1)	1
Pipefitter (Cl. 2)	2
Pipefitter (Helper)	2
Sheet Metal (Cl. 1)	2
Sheet Metal (Cl. 2)	2
Sheet Metal (Helper)	2
TOTAL	74

ADMINISTRATIVE COST SCHEDULES

Secretary
Estimator
Safety Supervisor

TOTAL 3

POWER PLANTS

FOREMAN
SUPERVISOR

TRADE	QUANTITY
Engineer	20
TOTAL	22

PLANT ENGINEERING DEPARTMENT SUPERINTENDENT

OPERATIONS SECTION

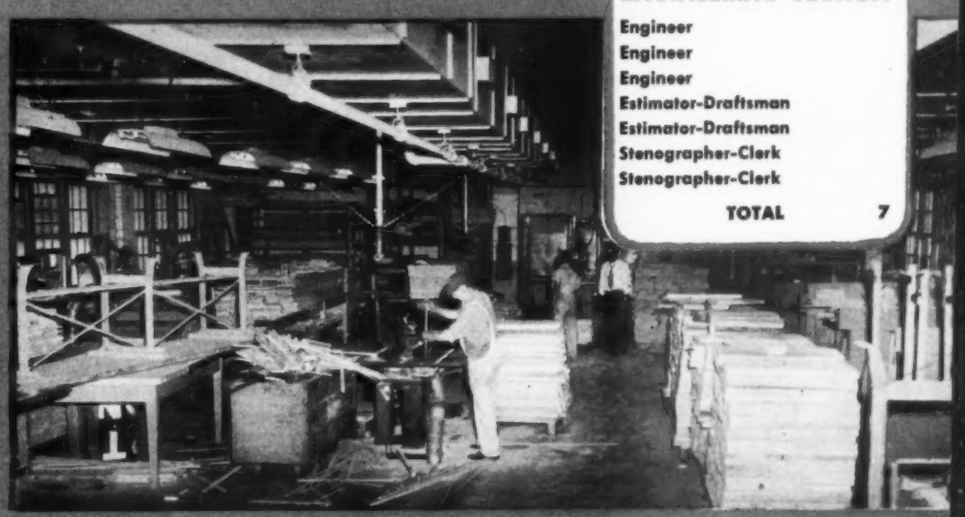
FOREMAN
FOREMAN
FOREMAN

TRADE	QUANTITY
Fixture Maker	1
Laborer	4
Fireman	1
Carpenter (Gr. Lead.)	7
Carpenter (Cl. 1)	3
Carpenter (Cl. 2)	2
Carpenter (Helper)	3
Electrician (Gr. Lead.)	4
Electrician (Cl. 1)	3
Electrician (Cl. 2)	1
Electrician (Helper)	6
Millwright (Gr. Lead.)	5
Millwright (Cl. 1)	14
Millwright (Cl. 2)	14
Millwright (Helper)	3
Plumber (Gr. Lead.)	1
Plumber	1
Pipefitter (Gr. Lead.)	1
Pipefitter (Helper)	2
Sheet Metal (Gr. Lead.)	4
Sheet Metal (Cl. 1)	8
Sheet Metal (Cl. 2)	3
Sheet Metal (Helper)	4
Welder (Gr. Leader)	1
Welder (Cl. 1)	4
TOTAL	103

ENGINEERING SECTION

Engineer
Engineer
Engineer
Estimator-Draftsman
Estimator-Draftsman
Stenographer-Clerk
Stenographer-Clerk

TOTAL 7



PHILCO BELIEVES THAT ADEQUATE WORK SPACE IS ESSENTIAL TO EFFICIENT MAINTENANCE OPERATIONS

ment have been made in the light of best qualifications and in quantities necessary to carry out the work in proper proportion. This has led to specialization. Whereas a millwright heretofore might have been engaged in all kinds of new or repair work, he now is fast becoming an expert, for example, in conveyor work.

Briefly, here are the underlying principles and objectives of the two main sections and four subsidiary sections provided in the new reorganization plan:

1. *Maintenance Department.* This department concentrates on all problems of a purely maintenance nature. Its 24-hour operations cover the company's 14 plants with a floor area of about 2,000,000 square feet.

A system of preventive maintenance, based on routine inspections, is being gradually perfected—in fact, it is already paying dividends. Maintenance engineering requires a brand of conservative judgment and foresight which is peculiar to this activity. Because personnel assigned to this department have no responsibilities other than maintenance, they are able to develop this approach to the fullest extent.

2. *Plant Engineering Department.* Almost in direct contradiction to the mental attitudes required in the maintenance sections, the plant engineering group is required to use a great deal of imagination and ingenuity in the development of designs for new manufacturing techniques. On this basis, the men in this department are permitted full latitude in their efforts in this respect, and by organizational status they are unhampered by other maintenance responsibilities.

3. *Material Section.* This section is completely responsible for maintaining adequate supplies of all standard materials used by both the maintenance and plant engineering departments. While wartime restrictions made the problem of handling materials one of primary importance, present scarcities have made the situation even more acute.

The material section is charged with the procurement of materials, and their receiving, storage, and distribution. It works closely and in harmony with the company's purchasing department. The cooperation between these two departments is such that both groups have full latitude in the discharge of their basic responsibilities. This understanding has consistently resulted in a good material situation, to the extent that no major project has suffered for lack of materials at the proper time.

Among the newer features stemming from this phase of the reorganization plan are (1) a parts numbering system, (2) an airtight tool charge-out system, and (3) improvement in receiving and materials distribution systems, involving exclusive handling of maintenance materials, but no others. Consequently, this department is able to cope with the peculiarities of the manifold materials encountered.

4. *Engineering Section.* Operating as a part of the plant engineering department, this section represents an extremely important unit of the organization. It provides engineering services for the entire plant engineering organization, and is frequently called upon to act in a consulting capacity for many of Philco's activities not directly under the jurisdiction of the plant engineer. It also prepares plans and specifications, is equipped to make its own prints, and prepares estimates and reports for management approval on all major projects.

The personnel of this section are men specifically trained in one or more branches of the engineering profession, which, coupled with their accumulative experience at Philco, provides an engineering service that is able to function accurately and rapidly. Not only plant engineers but also plant operating executives can appreciate what this means. Incidentally, the three engineers in this section act as contact men with the plant operating executives to interpret their requirements into engineering action.

5. *Administrative.* This group reports directly to the plant engineer and is purposely not associated with either the maintenance or the plant engineering department. It handles the highly important functions of costs, budgets, and operating schedules. By reason of its independent status it functions both as a control and as a stimulus for each of the maintenance operating sections. The desire of these sections to observe rigid adherence to schedules has created a spirit of competition that has resulted in faster and better work at lower cost.

As a part of the administrative plan, weekly schedule meetings are held and attended by all grades of maintenance supervision, including representatives of the material and plant engineering sections. It is recognized that workable schedules depend on cooperative planning, and must be tied in with the regular production schedules.

In this group, it will be noted, is a safety supervisor, who oversees the safety activities of the diversified maintenance operations in the various plants. Safety engineering is considered a vital part of the program and necessary to the welfare and morale of the entire organization, not to mention its contribution to reduction of over-all costs.

This organization is particularly blessed with an understanding and cooperative relationship with the accounting department. Freedom of movement is accorded both groups within the limits of good accounting practice, and the over-all result has been extremely gratifying both to the plant engineer and to the chief accountant.

6. *Power Plants.* The operation of 12 separate boiler plants of various capacities and operating characteristics is treated as a separate function under the command of a chief engineer reporting directly to the plant engineer. All power plant problems are handled by this group, which brings into play all its specialized knowledge and experience in the thermal engineering sciences to insure safe and efficient operation of the plants.

Although the pattern of reorganization as just given has not revealed many of the details of administration and operation, it is specific enough to demonstrate how the basic principles have been applied to eliminate previous shortcomings and insure an efficient organization.

The importance of one other fact, that of provision of adequate work space for this organization, cannot be minimized. In fact, this provision had to precede the actual reorganization. At Philco the maintenance department occupies a separate building, which comfortably houses all of the maintenance shops and offices, and provides excellent facilities for receiving, storing, and disbursing all maintenance materials.

Although the new organization has been in effect only a short time, the results already have proved so beneficial that the long-range success of the plan is a foregone conclusion.

LET'S MAKE A FREE AMERICA TICK

ERNEST T. WEIR • CHAIRMAN, NATIONAL STEEL CORPORATION
PITTSBURGH

The United States approaches a showdown. The people must decide whether the conditions under which they live are to be established on the basis of self-government and individual freedom, or on the basis of compulsory state control. Today we have neither one thing nor the other, but a mixture of both.

History abounds with lessons that such a mixture must be temporary. Freedom cannot tolerate compulsion, nor can compulsion tolerate freedom. They are mutually antagonistic and just will not work together. So whether we do something or nothing about it, we eventually shall have either a free country or the compulsory state. But which it will be, is too vital to be left to chance.

Those who prefer freedom must *do something* about it. Freedom is never safe unless there is active vigilance and active resistance to every infringement upon it. The passive attitude will lead to the compulsory state because it is in the nature of all government, if unrestrained, to increase and extend its power to the ultimate.

In my opinion, the leaders of American industry, by their position in life and their opportunity to know the value of freedom, are charged with a special obligation to be leaders in the fight for freedom. And by "leaders" I mean not only the so-called "brass hats," but also men in all levels of management.

Economic forces have reached a climax of unbalance. Sooner or later, they must return to normal equilibrium or America's productive machinery will break down.

This unbalance is evident throughout our economy, but the most prominent and most serious example has resulted from the substitution by the present Federal Administration of *compulsion for free collective bargaining in the field of labor relations*—a substitution made, by the way, with no authority either in law or by sanction of the people.

Last autumn government officials and agencies joined in a concerted move to promulgate the weird economic theory that wages had no relation to prices. This position of government touched off the great wave of strikes for huge wage increases. Government entered those strikes, not as an impartial seeker of industrial peace, but as a partisan on the side of the big unions. The process of collective bargaining was discarded entirely. Government settled the strikes by its own favored method. *That method was the use of compulsion.*

In the steel strike, the entire industry was shut down. The steel industry is composed of hundreds of companies of all sizes, which make and distribute many different types of products under widely varying physical, regional, and commercial conditions. Government entered the picture. It summoned only one representative of management from this large and diverse industry—Benjamin Fairless, the president of the industry's biggest and richest company. On the presumed ability of that com-

Ernest T. Weir is known throughout America as a leader of industry who has stood for the real freedom of labor and for genuine collective bargaining. In attempting to attain those objectives in his own company, he has never been afraid to stand up for his own, his company's, and his workers' rights.

His Weirton Steel Company has an independent union, the only major labor unit in the steel industry that went through the war without lost time. In fact, since 1933, not one minute of production time has been lost at Weirton because of labor troubles.

With such excellent labor relations, Weirton set enviable wartime records. It was the only steel company to roll brass, helping to break the rolling bottleneck in the brass industry and to assure the brass necessary for 50-caliber machine gun cartridges. Weirton did three other extraordinary jobs, including the rolling of magnesium, silver chloride, and a material used in the atomic bomb.

Weirton workers also turned out 8-in. howitzer shells, exceeding the contract terms repeatedly, and helping to meet the critical shortage at the time of the break-through to the Rhine. The company, and its parent, the National Steel Corporation, led the industry in staying in the black through depression years, and it has been—and still is—a leader in paying high wages.

Weir's own story is no less dramatic. He went to work as an office boy at 15, was chief clerk of a tin-plate mill at 26, and manager of the plant at 30, when he left to start his own business. Pushing the company which was to become Weirton Steel through its early days, meant fighting every inch of the way, but he met his payrolls, paid for his materials COD, and the company grew, to become a leader in the steel industry.

In 1929, Weir formed the National Steel Corporation. In addition to Weirton Steel Company, National's principal units are Great Lakes Steel Corporation, Detroit; Hanna Iron Ore Company, Cleveland; Hanna Furnace Corporation, Buffalo; and National Steel Products Company, Houston, Tex.

A director of an uncounted number of companies, member of a score of clubs, and with widespread interests, Weir says his chief hobby is finding out what makes the economic system tick. His chief interest, probably, is the Maurice Falk Foundation which works toward the "encouragement, improvement, and betterment of mankind."

pany to pay, government virtually dictated a settlement that was not far from the CIO's original demands, then announced its action as the "settlement" of the steel strike.

In the rail strike, the compulsory power of government was turned against workers. The increasing tendency of government to rely on force to gain its ends climaxed in President Truman's demand for legal authority to coerce employees into servitude by use of military draft power.

In the coal strike, concurrent with the rail strike, government used its compulsory power first in yet another way; it seized the industry. Next, it excluded management from the picture. Then, dealing with the union alone, it made an "agreement" that granted every union demand—against the plain and overwhelming intent of Congress as expressed in passage of the Case Bill. In this way, in these free United States, the coal industry has been "nationalized." Every coal mine in the country is now in the hands of the government and must stay there unless and until its management is willing to concede not only all terms made by the government with the union but, in addition, any new terms the union sees fit to demand.

Who benefits from this totalitarian conduct?

Certainly not management. But this would not seem too important to many people, so let's look further.

Workers? Superficially, yes—they got a big wage increase. But it bore an expensive price tag which can be itemized in part as follows:

1. A great many workers were willing to settle without a strike on the basis of terms offered by their particular companies which the workers knew to be fair and reasonable. For the period of the strike, such workers lost their former wages *plus* the increase.

2. In long strikes, all workers lose in total wages an amount which can be balanced by any wage increase only by years of steady work.

3. Workers in many small steel companies were out of work after the strike in the basic industry was settled—for months, in some cases. This was caused in part by the fact that these companies held out longer against wage rates they could not afford, and in part by the fact that there was a serious time lag in the delivery of steel necessary to their operation.

4. Workers in many small companies have lost their jobs. This resulted from the necessity for managements to equalize wage costs by permanently reducing their force in the hope that the productivity of the remaining workers could be increased.

5. All workers must share the cost of higher prices which result from wage increases.

The items cited are part of the price paid by workers in strikes in which they are direct participants by their own will or otherwise. Workers pay an additional price for strikes in which they have no direct part. As this is written, there is an article in a Pittsburgh newspaper describing a strike of 32 railroad workers *against the decision of a government agency* which is throwing 45,000 steelworkers out of their jobs. The article quotes a steelworkers' union official as saying:

"It's a shame because some of the men in the plants have had only two weeks' work since the first of the year because of the steel strike and the coal strike—and now this thing."

To his last few words, 140,000,000 Americans can add a devout "Amen."

Does the general public gain? Obviously not! While a strike is in progress, the public loses, directly and indirectly, to the extent that wages and production are lost. It loses again because it must wait still longer for the goods of all kinds now so desperately short. It loses ultimately because it must pay in higher prices for any wage increases gained by strikes.

Who *does* gain? In final analysis, labor leaders, who increase and entrench their power by hollow victories —and politicians who see in these leaders a source of political support.

This is not an argument against strikes. Under proper limitation in the public interest, the right to strike is a necessary economic weapon in the hands of both organized and unorganized workers. Human nature being what it is, a strike may be the only resort by which a dispute between labor and management may be finally resolved.

This *is* an argument for the settlement of strikes by *real collective bargaining.* It has been my experience that when the management of an individual company and a local union know that they must settle their differences by real collective bargaining with each other, neither side is inclined to be too stiff-necked in its attitude. Both have much to lose; neither has much to gain by a long strike. Both know when a wage raise is justified, and both have a good idea of the figure that is fair and reasonable. In the great majority of cases, agreements are reached before much damage is done.

With government in the picture, the entire situation is changed. The negotiations are shifted from an individual company basis to an industry-wide basis. This injects a false note into the proceedings. There are no such things as "industry conditions" that apply to every company with equal force. But government and the unions act as though there were such conditions.

Knowing that government will back them up, the unions "shoot for the moon" instead of making reasonable demands. They make no concessions to smaller and weaker companies because such action might weaken their position in regard to the whole industry. Under these circumstances, it is natural to expect strong resistance from management—and all the more because management knows that government's conduct will be guided by political rather than economic considerations. With an entire industry strike-bound, neither management nor labor is subject to normal competitive restraint. Management knows that other companies are not supplying its customers; labor knows that other employees are not at work while it remains idle and payless.

It is these conditions—produced by the substitution of government compulsion for free collective bargaining—that have bred the recent disastrous strikes. They will continue and grow worse, unless a resubstitution is forced by public opinion.

The chief victim of compulsory state control in labor relations and otherwise will be American small business. The plain fact is that only the big business is strong enough to bear the economic burdens imposed.

NEED FREEDOM TO GROW

Small business needs freedom to operate and survive. Under the best of conditions, most new enterprises fail. It is only sound ideas carried out with good judgment, initiative, and industry that give a business its chance to live and grow. This chance is nullified when a business must be operated not in accordance with its own abilities and necessities but with wage rates, selling prices, and other phases set in accordance with economic, social, and political notions of someone in Washington.

America needs its small business. It is the source of new jobs and wages, new ideas, new products, and new leaders. It provides a type of competition that keeps the entire economy alive and aggressive. It introduces the element of change that prevents the productive structure from becoming rigid and static.

My own company is a good case in point. Our start was made many years ago in a small, badly run-down plant that employed a few hundred people. Despite severe competition from large, strong steel companies in a field then considered crowded, we were able to survive and to grow into one of the steel industry's major producers.

Without qualification, I say that that experience cannot be repeated under present conditions. In fact, present conditions can result only in fewer and larger companies. State compulsion is producing the very situation that will be pointed to as the need for more state control.

IDEOLOGICAL ASPECTS

To this point, I have dealt only with the economic aspects of state control. It is vitally important to consider the ideological aspects. The loudest champions of the controls now exercised by the United States government are the individuals and groups devoted to collectivism and opposed to the American principles of individual freedom and self-government. Taken together, these controls have moved the country far in the direction desired and planned by power seekers and leftwingers.

Americans are entitled to compulsion rather than freedom if compulsion is what they honestly and consciously want. But they have never been given the opportunity to decide. Controls have been fastened on them under various labels and pretexts. Certainly if our people, like the British, were to vote openly for state control of industry, there would be nothing for any good American to do but to go along and make the best of it. But they have not been given that right, and in my opinion they never will be by the present Administration. Those now in power much prefer direct action, even without a semblance of authority, and in the forced settlement of the steel and coal strikes, they went far beyond the scope now allowed the British government.

And—because the use of compulsion necessarily leads to the abandonment of incentive and the adoption of complete reliance on compulsion to make the economic machine work—we must turn the tide in America.

Management must take the lead in developing public understanding of this vital issue. No other group in the country can so clearly show the fallacies of false economics, the dangers of reliance on compulsion. To protect the workers in industry, to protect small business, to maintain the tradition and effectiveness of American cooperative leadership, for the greater good of the greatest number of people, management must lead.

And when you ask—as many will—what you can do, I can at least point out your starting point.

First, think the problem through for yourself. Make up your own mind. Study every Washington move and decide whether it is for the benefit of the greatest number of Americans, whether it meets the tests of American freedom and justice.

Then—do your best to make the problem and the remedy clear to every person and every group you come in contact with. Impress your opinion on your political leaders, on your representatives in Congress.

Do everything you can in your own community politics to elect able local leaders and to influence the action of your representatives in Washington.

And—most important if you are in industry—see that all of the skills and tools of public relations are used to give workers the fundamentals of sound economics, to show them that the only way to higher wages is through greater production, to show them that it is impossible to get something for nothing, to show them that legislation favoring special groups must in the long run work against the interests of all.

POWER OF PUBLIC OPINION

Americans, using this democratic method, can help to crystallize public opinion. And public opinion will, in the end, turn the tide against the leftwingers, the power seekers, and the special interests. It will end the compulsions of government on labor-management bargaining. It will allow natural economic balances to return.

We must use our leadership to restore the balance now to prevent a breakdown and depression, which would bring with it the threat of control by the state.

We must use our leadership to make progress in returning to American principles—the most "progressive" move our leaders can make.

We must use that leadership now—before American principles are completely abandoned. As yet there is no law against free speech, against the right of a man to defend American principles.

But—as it happens in every state that that begins to use compulsion and then comes to rely on it—that law may come.

Let's take the lead now. Let's make a free America tick!

EACH INSPECTOR RESPONSIBLE FOR SPECIFIC ELECTRICAL EQUIPMENT

J. E. BURNS • CHIEF ENGINEER, MAINTENANCE AND CONSTRUCTION
E. R. SQUIBB & SONS, BROOKLYN, N. Y.

A simple but highly effective program of preventive maintenance for all electrical equipment has been worked out over the years at the Brooklyn plant of E. R. Squibb & Sons. Basically, it involves making each of the several inspectors responsible for the condition of certain equipment. Sufficient flexibility is inherent in this scheme to permit inspectors to make their examinations as often as they deem necessary. The chief electrician supervises and checks the work of these men.

A large amount of electrical equipment is installed throughout the fifteen multi-story buildings comprising this plant. For example, approximately 2000 motors, some of which operate 24 hours a day, are required to drive a wide variety of production machines and other equipment that turn out the many different pharmaceutical and biological products made here.

Here's the way the system is applied to some of the more important kinds of electrical equipment:

Motors and Controls. One man is responsible for this equipment. Many of the motors are on extremely important applications—among them the deep-well pump, which supplies cooling water; feedwater, oil, and other pumps in the boiler house; conveyor systems; and air conditioning systems. Some of the motors in these services are inspected at least once or twice a day.

For the most part, however, this inspector follows a regular route through all floors in the different buildings. Every motor and control in the plant is looked over at least once in two weeks. Motors are checked for cleanliness, overheating, and any evidence of abnormal conditions.

Starters and pushbuttons or controllers are inspected at the same time for loose connections, condition of coils and contacts, the proper sizes of heaters and fuses, and cleanliness. The inspector makes any adjustments or repairs that can be handled within, say, 15 minutes. Anything of a serious nature is reported at once to the chief electrician.

Lubrication and cleaning of all motors is done by another man, who also follows a regular route. In addition to the wiping off and cleaning done by the oiler, practically every motor is blown out at least once a month, at night. Since it would not be feasible to provide a compressed air outlet at every motor location, use is made of a portable outfit which provides air at 40 pounds per square inch.

Finally, every motor is completely overhauled at least every two or three years, oftener if necessary. This overhauling involves thorough washing in a suitable solvent, checking bearings and shafts for wear, testing the windings for defects, and painting them with a high-grade insulating varnish. An insulation resistance test is made before the motor is put in spare stock, and again before it is sent back into service. A recording wattmeter is continuously in use, checking up load conditions on one important motor after another.

Elevators. The eleven elevators are so important for the transportation of personnel and materials that failure of any one can have serious consequences. Four men are assigned the task of keeping these elevators in good order, three on the day shift, one at night.

They make a daily inspection of practically every part of the elevators and handle all repairs, except reroping. The man on the night shift does all inspection and repair work that involves taking an elevator out of service.

Lighting System. A change is gradually being made to fluorescent lighting, so that at present about half the 10,000 fixtures have 150-watt filament lamps in glass-steel diffusing units. There are about 5000 fluorescent lighting units, which have four 40-watt tubes.

Cleaning fixtures, replacing burned-out or blackened lamps, and answering trouble calls take all the time of two men. They make a daily inspection of the lighting fixtures on all floors, replace blown fuses, and make any repairs that can be handled in a few minutes.

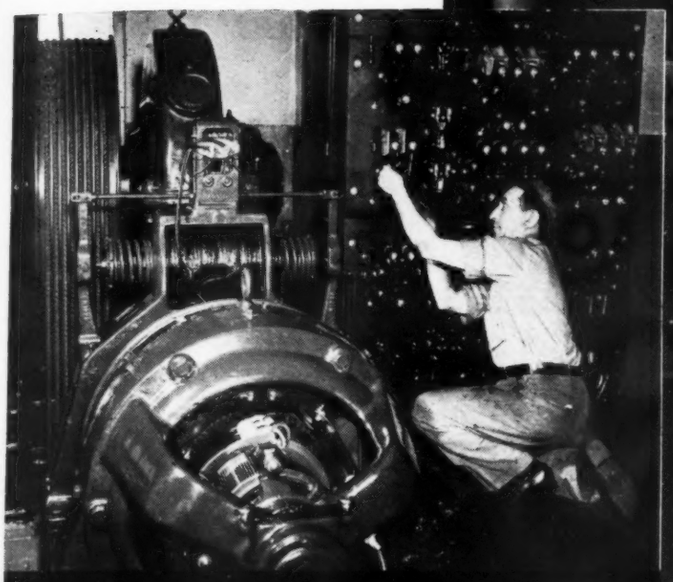
Electronic Equipment. Devices that employ electron tubes include dielectric heating equipment, phototube control for a conveyor system, and some tank-level indicating devices. All of this equipment is in charge of an inspector repairman who has had specialized training. He makes frequent inspections, replaces tubes, and does any other necessary maintenance work.

Other duties assigned to him include supervision over the charging of the electric truck batteries, care of the fire and burglar alarm systems, the time clocks, and the time card recorders, which are tested twice a day.

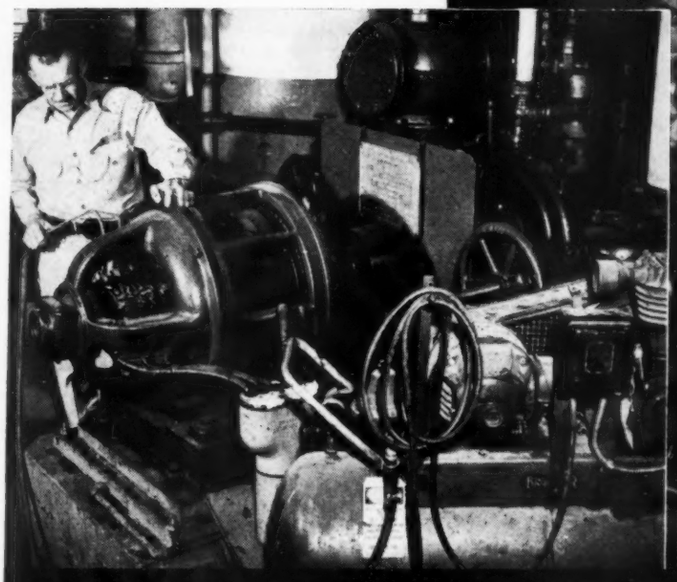
Air Conditioning. Air conditioning systems must be watched carefully. Making sure that all controls are in good condition and operate properly is one of the most important responsibilities. One man is assigned to this work. He keeps all the systems under practically continuous observation, cleaning and adjusting the controls as required.

Air supplied to certain departments must be as free as possible from dust; therefore it is passed through a large electrostatic precipitator. This unit is checked frequently to make sure that everything is in order. At least once a month it is thoroughly washed down and cleaned out.

The inspector who handles this work is responsible also for the condition of all thermostats controlling the unit heaters which are used in the areas that are not air conditioned.



Four men—three during the day shift, one at night—keep elevators operating. Practically every part is inspected daily. The night man does repair work that involves stoppages



One man, who follows a regular route, oils and cleans all motors, which are also blown out at least once a month. A portable compressor, providing air at 40 p.s.i., is used

Each of certain types of electrical equipment is in charge of one man, who is responsible for its upkeep. Here inspector connects graphic ammeter to check load on a large pump motor

SAFETY IS AS EASY AS A B C WHEN EVERYBODY WORKS FOR IT

KEITH L. MOREY • DIRECTOR OF SAFETY, THE BUDA COMPANY, HARVEY, ILL.

"There's a piece of a man's hand on this drill."

I took the ½-in. drill bit, the flesh still clinging to it, from the foreman who addressed me.

"In a hurry, I suppose," I commented.

"Only had a few pieces to do. Thought he'd hold 'em in his hand," the foreman said. "One slipped. He's over in first aid now—hand torn to the bone."

This worker in Department 52 was lucky. His injury treated promptly, he has his hand today and is back on the job. But the time he "saved" by not fastening down his work at the power drill was several days' lost work. The drill, the flesh now dried, is one of several exhibits, each of which is worth a thousand words of caution.

Nine accidents out of every ten come about because the individual worker gets overconfident or in a hurry, thinks he can "get by" by doing it some other way just this once.

Take the case of Joe Cassidy. The first joint of his right middle finger is in a bottle on my desk. Joe was cutting some pieces of sheet iron on a small power shear. Everything was going along fine until he got the idea he could do the job faster if he cut the pieces from the opposite side of the shear. When he worked from that side, the guard was ineffective. He lost part of his finger with the first piece he tried to cut.

The Buda Company is engaged in heavy industry, and I do mean heavy. Frequent moving and handling of gasoline and diesel engines and other industrial and railroad products offers innumerable chances for something to go wrong. One man's mistake or lack of care can easily cost another man's life.

Many years ago the company realized that if fatalities and disabling injuries were to be avoided—if Buda was going to be a healthy place to work—everyone who worked here must somehow be imbued with such enthusiasm for accident prevention that chance-taking would be unpopular. Safe-thinking had to be made a part of the job.

That Buda has had some success in this effort is attested to by a wartime citation to our local union from the U. S. Secretary of Labor, an award from the Greater Chicago Safety Council, and two plaques from our insurance company for records in no-accident contests.

Much credit for our record must be given to Local Union No. 1091 of the United Steel Workers of America-CIO, and its shop safety committee, which is part of our safety administrative program. As a safe plant is largely a mat-

"There's a piece of a man's hand on that drill," says the foreman to the author. Drill is now a prize safety exhibit

The wrong way. No time was saved when workman held part to be drilled in his hand—the drill tore through his palm

The right way. Safety rules are followed. Part is properly clamped in the jig, and both hands are well out of the way

ter of individual care and right thinking, we cannot give too much credit to the efforts of this organization.

We also must pay tribute to as fine a supervisory organization as any plant ever had. Every supervisor is a member of our supervisors' safety committee, whose recommendations have done much to keep us on the alert for dangerous conditions and practices.

Buda is fortunate in its connection with an insurance company which firmly believes workers would rather have pay checks than compensation checks. Its safety engineers, experienced through years of contacts in many plants, have been able to eliminate many sources of danger which we might not have seen. This company has educated and developed leadership among Buda foremen and workers through planned, practical, and efficient programs. Our modern, efficient first aid department reflects the counsel and advice of its experienced nursing service.

But all these things would fall flat except for the sympathetic attitude and 100 percent backing of top management. President J. S. Dempsey, and Personnel Director George Moecker have worked with Buda men and women for more than 30 years. In that time this 65-year-old company has grown tremendously, but even today they know a lot of us as "Tom" and "Bill' and news of even a minor mishap is a matter of real personal concern in the front offices.

With this fine cooperative background, safety begins at Buda. And the two safety committees—shop safety committee of fifteen elected members of Local 1091 and supervisors' safety committee of 80 foremen and supervisors representing all plant departments—comprise the active machinery through which our people cooperate to make it work.

Plant-wide interest in these organizations, which meet once a month on company time, is sustained by the fact that the complete minutes of both organizations are posted on every plant bulletin board and the fact that they contain all recommendations for safety improvement presented by the workers.

New recommendations are presented at every meeting of both committees. No recommendation is ever lost sight of. It is carried over in succeeding minutes under "Recommendations Not Completed" until taken care of. Groups around the bulletin board when minutes are posted, and the gripes if "my recommendation" is not taken care of promptly, attest the personal interest. The gripes are not serious. Workers all know that once either safety committee has approved a recommendation it will be taken care of as soon as time and material permit.

"Here's what they did with my safety recommendation." Buda workers gather around bulletin boards to check the minutes of safety meetings, which are always posted

Two excerpts from one report will show the type of recommendations made. These appeared in the minutes of the supervisors safety committee under the heading, "New Recommendations."

M-110, Department 69—Destroy makeshift platform at loading docks used by employees to enter and leave building. Install steps or fill in.

M-111, Department 69—Fan in spray booth does not pull paint fumes out of booth properly. Probably caused by accumulated paint on fan blades. Fan should be cleaned and motor speed checked.

The safety engineers of the insurance company are as interested as we are in these recommendations. They often suggest the most effective way to guard against the hazardous conditions.

No effort is spared to make these safety committees meeting as live, interesting, and practical as the ingenuity of the insurance safety engineers can make them. Last year, Max Woodward of their staff conducted a series of sound-slide lectures on:

"Production With Safety"—the importance of the foreman in seeing that new employees are taught to do their job safely.

"Stop—Look and Listen"—The time and trouble a foreman can save himself by maintaining a careful systematic inspection of all the tools and equipment in his department.

"Principles and Interest" — Importance of the supervisor in maintaining employee interest in safety.

"Doctor's Orders"—The supervisor's role in making sure that everyone in his crew understands the need for immediate first air treatment for even a slight injury.

"Certificates of Achievement" were awarded by the insurance company to all who completed this course in "Safety Management for Foremen."

A close human side of these committee meetings is the appearance from time to time of some of our people who have learned safety the hard way. These men describe the circumstances which caused their injuries, answer questions on their ideas as to what was wrong, and help the committee work out recommendations that will avoid future accidents.

One day last fall, Martin Valach and Frank Sabastian told how they had been burned and otherwise injured while washing the electric motor on a milling machine with gasoline. The washing completed, they turned on the air hose to dry out the motor winding. A flash of hot flame shot out, followed by an explosion. Both men received severe burns on the hand, face, and arms. Sabastian's left arm was cut when he was knocked down by the force of the explosion.

The supervisors recommended that all motors be thoroughly cooled before washing; that a 50-50 mixture of gasoline and a non-toxic, non-explosive cleaning fluid be used for washing motors; and that protective equipment such as face shields, arm guards, and asbestos mitts be worn while cleaning.

Frank May was invited in one day to tell how he was severely scalded at the wash tank in the engine assembly department. Someone had added too much soap to the tank, turned up the steam, and caused the foam to run over. May turned the steam off and attempted to turn on the cold water to cool the tank. Instead, he accidently turned on the air valve which was located next to the water valve. The scalding water gushed over him.

The supervisors recommended placing the air and water valves at opposite ends of the tank. As an added precaution, the air line in the vicinity of the valves was to be painted red.

These meetings go far in developing safety leadership among the foremen and workers themselves. Many of our plant foremen are well on their way to becoming apostles of safety in their own right. They can and do lead progressive discussions on specific ways to make Buda safer and healthier.

Such a talk was led recently by Joe Locker, yard supervisor, on the subject of "Falls and Ladders." Charles Vitaska, foreman of the castings cleaning department, spoke on "Foot Hazards and Safety Shoes" at another meeting. A talk by George Stephenson on the "Safe Use of Abrasive Wheels" is typical of the safety discussions conducted by our own personnel. That our first aid department contributes more than bandages and medication was indicated by Mrs. A. Blohme, R.N., who is in charge of that department, in a recent talk before a safety committee.

Then I have a few "persuaders" of my own, like the man-eating drill we spoke about, or the pieces of Joe Cassidy's finger. It isn't easy for a man not to be more careful or more urgent with his fellow-workers along that line after he has seen these exhibits.

I have a pair of shoes that saved Dave Iliff's foot one day when a heavy part crashed in Department 54. Gashed from toe to instep, they did their job for Dave. He was happy to settle for a black and blue spot. We bought him a new pair of shoes. His old shoes have already persuaded a number of skeptical workmen that perhaps safety shoes aren't as uncomfortable as they thought they were. Then there's the gashed ordinary street shoe of the chap who "just didn't happen to have them on" one day. He wasn't quite so fortunate.

I have, too, a pair of safety goggles that saved Bill Taylor's sight when things started flying in the toolroom one day. Smashed beyond repair, they are mighty convincing evidence.

Accident prevention is really as easy as ABC . . . if everyone works for it. There are only two causes of most injuries—violation of a safe practice rule, exposure to a mechanical hazard. Our insurance safety engineers, our supervisors, and our shop safety committee can do a pretty good job of keeping the mechanical hazards down. We know what to look for.

But sticking to accepted safe working rules on any given job requires safety-minded thinking on the part of the worker. The man who runs the machine or uses the tool is the real hazard.

Our aim at Buda is increased recognition of this fact among our people. In the proportion that safety is everybody's business, Buda will be a safe place to work.

Bill Taylor shows George Moecker, personnel director, how goggles saved his eyes when things flew in the toolroom one day. Goggles are now in the safety director's exhibit

RADIANT HEAT KEEPS LOADING AREA FREE OF SNOW

JAMES MONTAGNES • CANADIAN CORRESPONDENT, *FACTORY*

Radiant heating pipes under the concrete loading area of Page-Hersey Tubes Limited, Welland, Ontario, kept it free of all snow last winter. At a heating cost of about 25 cents each hour of snowfall, the necessity for manual or machine snow removal has been eliminated, and normal traffic has been maintained under conditions no worse than a rainfall.

The system consists of runs of welded heating pipes, laid in continuous form on a concrete base and supported on metal rods. The runs are manifolded to heavier pipes which lead directly to the plant's heating system. After laying the pipes, the area—which covers 6000 square feet—was topped with concrete to a height of 1 to 1½ inches above the crest of the pipes. The entire layout was pitched toward a drainage basin located near the center of the loading area.

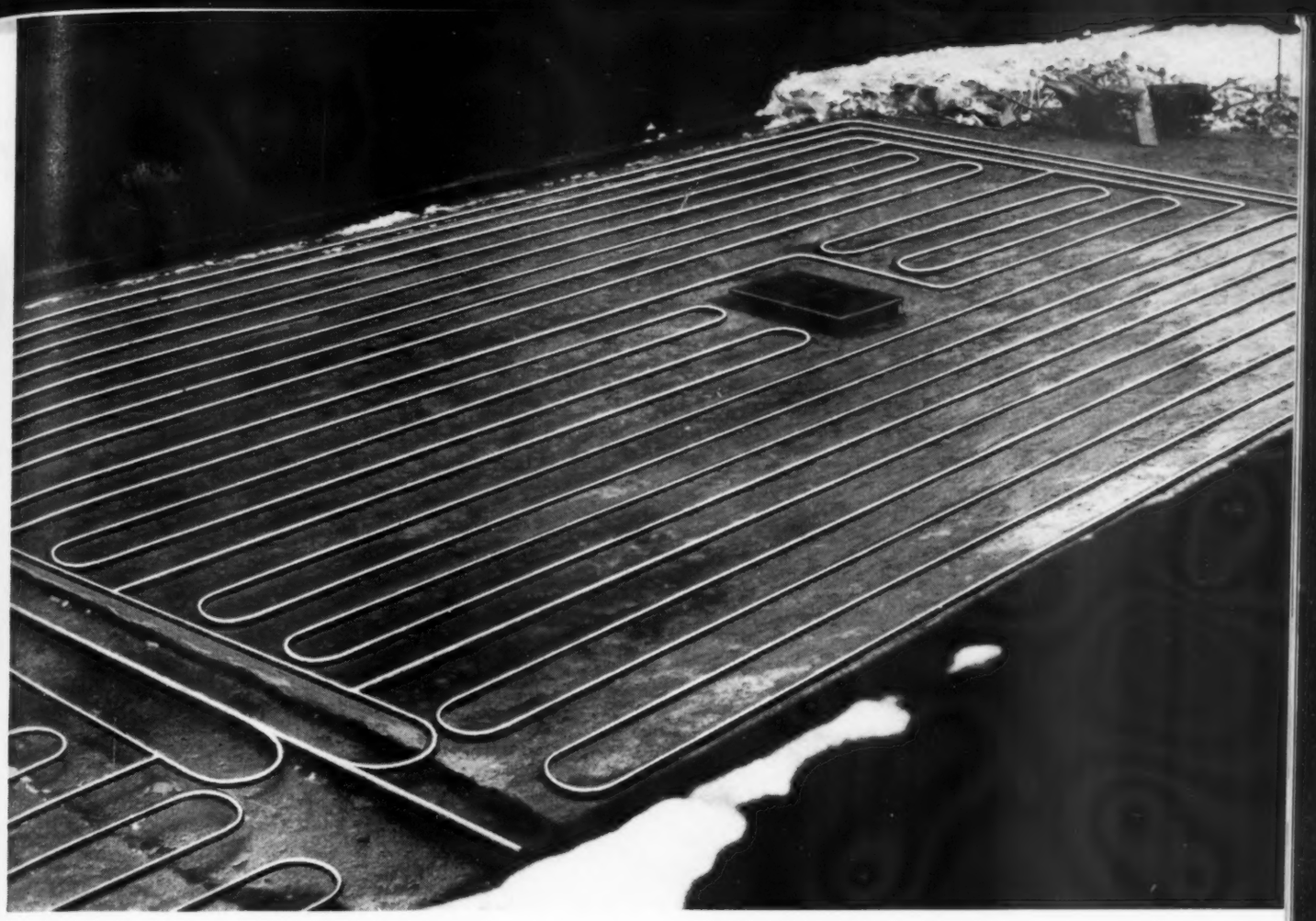
Heat is furnished by the circulation of a hot anti-freeze liquid which is pumped through a heat exchanger placed in the closed system. Anti-freeze liquid was chosen as the heating medium because water is likely to freeze when the heating system is not used for snow removal, and because steam is inefficient when mixed with condensation. With an anti-freeze liquid, moreover, the pipes require no draining in summer or refilling in winter.

Loss of anti-freeze by evaporation is not expected to exceed a pint for the entire system in a year. The welded piping eliminates leaks, and the only possible leak is at joints where a heat exchanger and pump join the system.

Cost of the installation, exclusive of the cost of laying the concrete, came to approximately 75 cents per square foot of surface. This included the pipe material, and labor for laying the pipe and connecting it to the heating system.

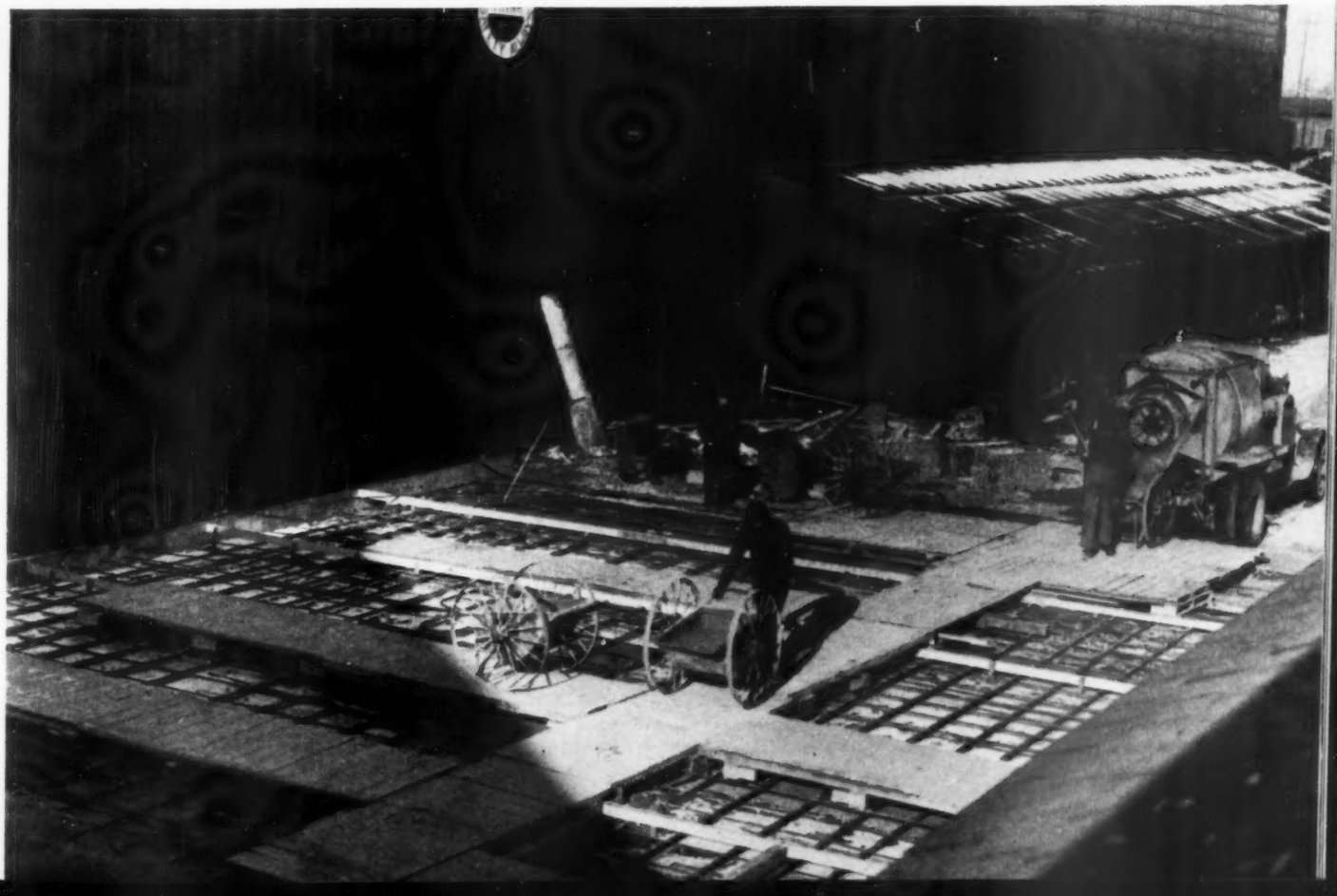
Despite the relatively thin layer of concrete above the pipes, there has been no damage to the road surface or piping system from the heavy truck traffic. This is attributed to proper pouring and drying of the concrete.

As soon as the snow begins to fall, a maintenance man turns on the snow removal heating system, and it is kept on until all snow is melted from the concrete surface. Although all the snow was calculated to melt and run off in the drainage system, it was found that about half the snow disappears in evaporation as soon as it lands on the heated concrete surface.



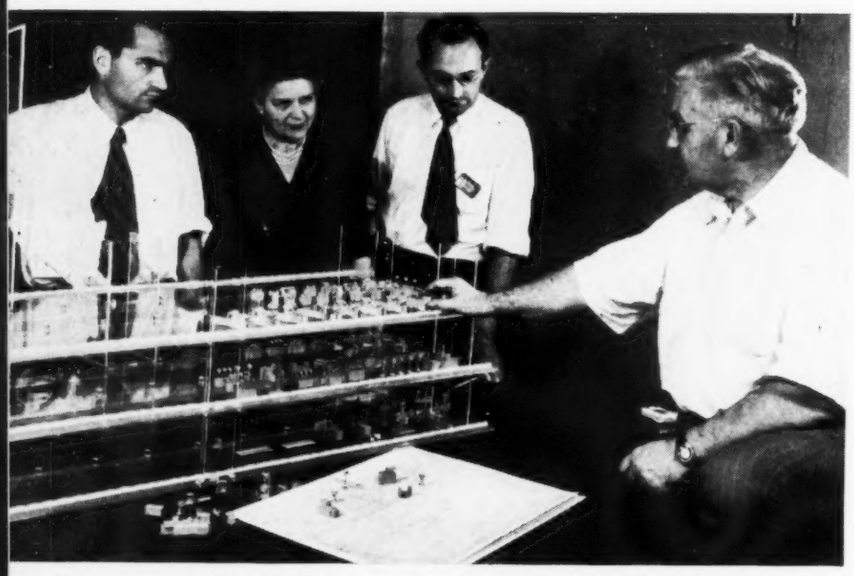
View of radiant heating system under loading platform, before top layer of concrete was poured, shows evenly distributed runs, and iron drain in center

Because of proper pouring and drying of top layer of concrete, no breakage has occurred, either to surfacing or piping, from heavy truck traffic



Initial planning takes place at factory operating level. Here specialists explain use of the equipment to plant personnel, experiment with possible layout arrangements. Base of machine models is to exact scale; tops are approximate replicas to show type of machine

TRANSPARENT PLASTIC PLANT MODELS IN THREE-DIMENSIONAL LAYOUT



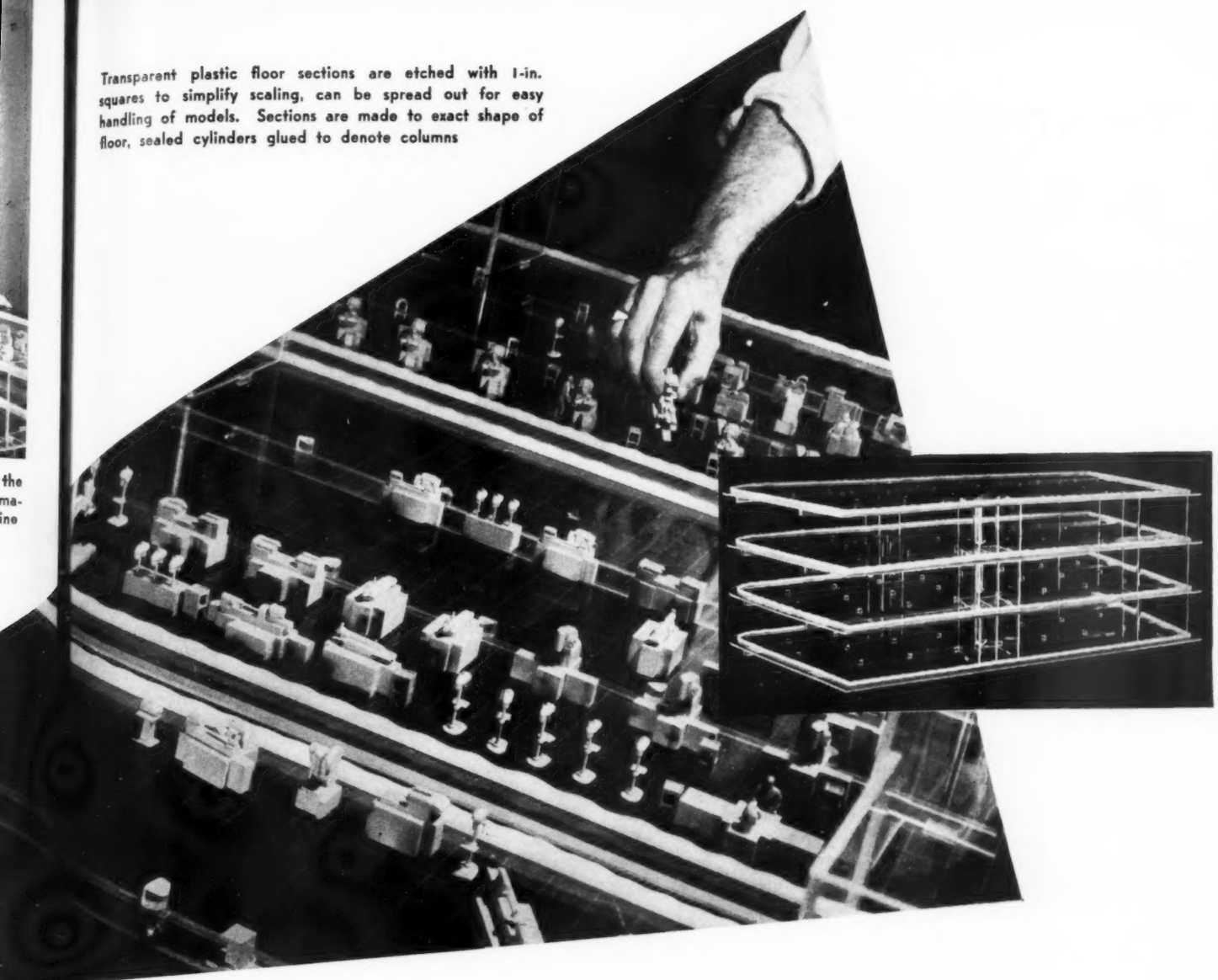
As planning progresses, floor sections are placed in position, so that layouts of all departments may be viewed in their true relation to one another. Changes suggested by the plant engineer take minutes instead of hours to execute, require no tedious redrafting of blueprints

Latest aids to three-dimensional layout are plant models of transparent plastic. Used together with scale models of machines and equipment, they are now speeding plans for a revised layout at Waldes Koh-I-Noor, Inc., Long Island City, N. Y.

Plastic floor sections are scaled ¼ inch to the foot, and duplicate the actual shape of the plan view of the floors in the plant. L-shaped and U-shaped plastic supports permit the floors to be piled one upon another to produce a replica of the entire plant, yet do not impair visibility of the layout on the lower floors.

Etched into the plastic are 1-in. squares, insuring proper alignment of models, and facilitating the making of sketches of the preliminary arrangements. When the final layout is agreed upon, photographs of the individual floors form a permanent record, and

Transparent plastic floor sections are etched with 1-in. squares to simplify scaling, can be spread out for easy handling of models. Sections are made to exact shape of floor, sealed cylinders glued to denote columns



the squares eliminate the need for scaling distances from the photograph. Each square represents an area 4x4 feet.

Templets, made to the same scale, are die-cut from light gray fiber stock to represent the floor space required for the operation of the machine, with the travel or movement of working parts that affect floor space included. Base of the 3-dimensional model is cut to the same size as the corresponding templet, and the work or table height is added. A die-cast machine top, mounted on this base, identifies the machine. Models of desks, tables, toteboxes, lockers, chairs, and human figures are used also.

Biggest advantages of these planning aids have been found to be that they speed and simplify rearrangements; eliminate drafting time; and permit analyses by men untrained in the reading and interpretation of blueprints.

No longer does top management have to visualize complicated blueprints. When final layout is agreed upon, models can be glued in place to prevent disarrangement, photographs made of each floor to form a permanent record

HEADWORK SAVES HANDWORK IN ELECTRICAL MAINTENANCE

HENRY NESS • CHIEF ELECTRICAL ENGINEER, TRIANGLE CONDUIT & CABLE COMPANY, NEW BRUNSWICK, N. J.

Alertness to all possibilities for simplification of work in the installation, use, maintenance, and repair of electrical service equipment at the New Brunswick, N. J., plant of the Triangle Conduit & Cable Company is steadily paying off in lower costs and minimum disturbances to production.

This alertness has been practiced from several important angles of approach. First, nothing is ever taken for granted as representing the only or best possible way of doing a job. Hence, precedents in material specifications, design, or layout of electrical equipment are always examined for possible improvement. It has been recognized that what might have been considered the ideal set-up several years ago, if history runs true, will eventually be superseded by a better one. Therefore, an open mind is kept to aid in its discovery.

This attitude points to two other primary angles of approach. In the search for better ideas, they sometimes have come from the study and experiences of others as reflected in new products and new applications. Keeping in touch with all pertinent sources of information, through trade literature and current business magazines, has therefore been practiced. Contrasting this, the resort to original thought in producing new ideas also has played an important part. Each method, however, has been seen always to complement the other when any worth-while idea was worked out in the plant.

All of which must not be taken to indicate that the effort to reduce electrical costs at Triangle has been a complex affair. As a rule, the utter simplicity of many of the solutions to the various electrical problems arising at Triangle has encouraged the belief that most of these solutions are a matter of common sense.

Take, for example, the problem encountered in the use of electrical immersion heaters for keeping wax solutions molten for insulation processing. At first, each heater was suspended in the wax in an open-top tank. As the process went on, consuming wax, the level of the wax went down, causing the residue above the level on the heater to harden and carbonize, and thereby impairing the heater's efficiency. Consequently, the heater had to be frequently replaced by a clean one. Cleaning the carbonized heater was not an easy job, either.

The solution of this problem involved the use of an enclosed oil bath, with safety vent, surrounding each wax tank, and then fully immersing the heater in this bath. Since the oil level remains constant regardless of the changing wax level, the heater is never exposed to the atmosphere, and this trouble has been eliminated.

FLEXIBLE LIGHTING

Care in designing the fluorescent lighting system of the Triangle plant has brought enduring economies. These economies stem from easy adaptability of the lighting system to any change in machine layout, also from ease of maintenance and operation.

Basically, the lighting system is laid out so that a lighting control panel exists on a column in the center of every 100-ft. square. All lighting circuits within that square can be turned on or off at that centralized panel. There is no searching around by operators, or need of walking great distances, when they want to operate light switches.

All lighting circuits are wired in conduit to permanent receptacles fastened to the underside of steel I-beams, at 12-ft. spacing along the axis, and about 12½-ft. spacing the other way. The luminaires are suspended by No. 4 link chain from special iron brackets, 8 inches long, which are clamped across the bottom web of the roof I-beams. These brackets can be easily removed or slid along the I-beam by loosening of two screws, so that the luminaires can be easily spaced as closely together or shifted as far apart as desired.

The connection from the fixture to the lighting circuit is through a flexible rubber-covered cable, terminating in a plug which locks into the receptacle by a 90-deg. twist of the hand. The cable connection is made long enough to permit placing the luminaire several feet to either side of the permanent receptacle. Should farther deviations be necessary to provide a concentration or dimunition of lighting at any one spot, a few luminaires with extra long cords are available for quick exchange. Removal of a luminaire for exchange or maintenance servicing involves only the unplugging of the lamp cord and unhooking of the fixture from the chains. Incidentally, the double chain suspensions were purposely arranged to hang like an inverted V to minimize the swaying motion common to fixtures hung from vertical, parallel chain drops.

Lighting of outside platforms and floodlighting of grounds have been improved in efficient application by the use of an automatic timer which turns these circuits on and off at the proper time. This timer is equipped with an astronomical dial which automatically compensates for the changes of seasons. Should there be a power interruption, the timer continues to operate mechanically for 10 hours so that it need not be reset.

Another thing that has been learned at Triangle is the value of standardization of motor controls for its more than 1000 motors. This plant has selected a type of control which gives excellent service, and which is available in ranges and sizes to meet all motor ratings up to several hundred horsepower.

As a result, the electrical maintenance force has learned to specialize in servicing all the motor control equipment, so that preventive maintenance of this

equipment has been developed to a high degree. Consequently, breakdowns due to control failures are less frequent, and what few there are can be more quickly repaired because of close familiarity with the equipment. Added to these advantages, standardization has meant keeping only a low inventory of repair parts, both because of limitation to one make, and of interchangeability of parts afforded by that make. In the long run, fewer interruptions to production and lowered maintenance costs have more than justified this policy.

Recently, because of plant expansion, it became necessary to provide new facilities for electrical power purchased from the public utility company. These facilities involved the installation of power transformers for reduction of a primary voltage of 4156 volts to a secondary voltage of 480 volts for machine power distribution lines, and of 208/120 volts for lighting and service circuits.

Here also, considerable foresight was demanded to insure trouble-free service, which resulted in the following "touches" that no doubt will go a long way toward attaining that objective:

1. Instead of just one bank of three large power transformers being selected for the rated load, two banks of smaller transformers were installed. The banks were connected in parallel feed to a common secondary, which permits either bank to be quickly disconnected. Either bank can be shut down at will, under proper load conditions, for cleaning. Should one bank go down, the other bank can continue to function, and daily production quotas can be maintained by diverting some of the day load to night work which ordinarily is lighter. Also, at night and during weekends, only one bank is used, involving less energizing current.

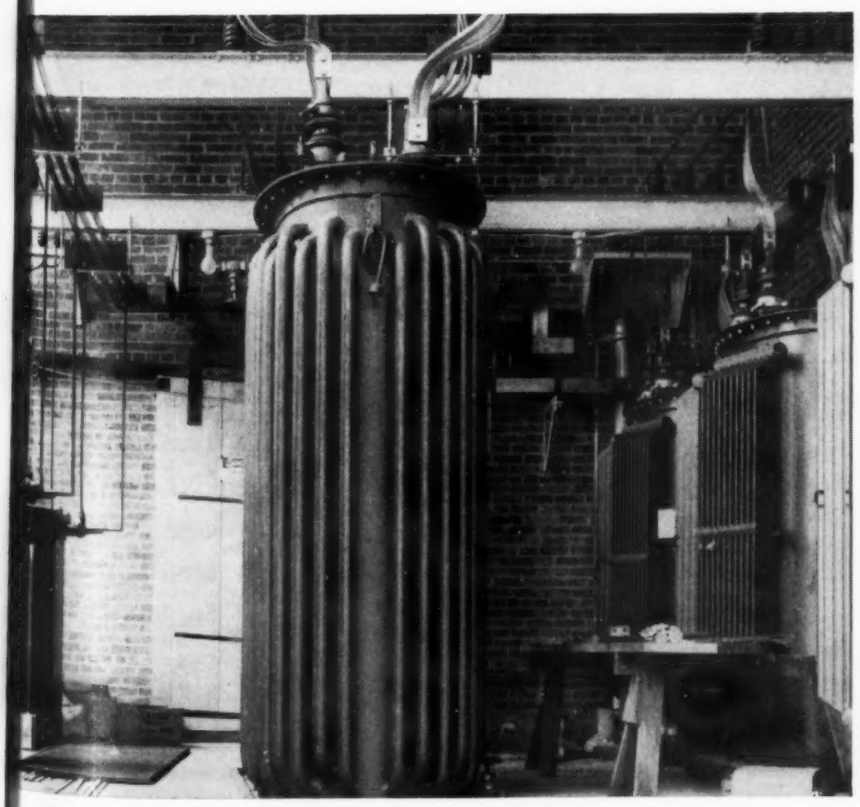
2. The transformer room in which the six power transformers and three smaller lighting transformers were located was made large in area, 20x25 feet. The layout was arranged so that it is possible to move any single transformer out of the room without disturbing any others. Also, the floor of the transformer room was elevated at truck platform height to simplify removal of transformers for repair.

3. Instead of using stiff copper connections from each transformer to the overhead copper bus, flexible braided leads were used, to minimize transmittal of vibration. This means easier maintenance of the overhead bus, and promises no service interruptions caused by loosened conductors and arcing.

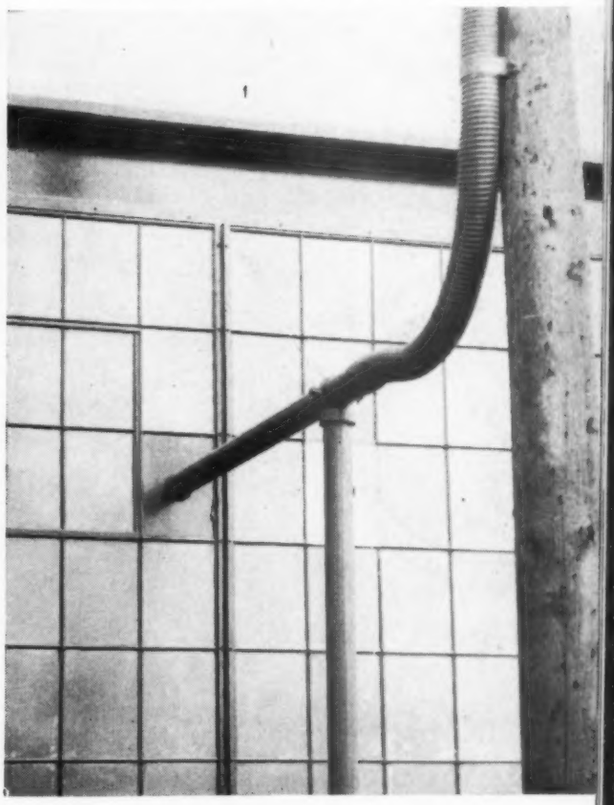
Several other features, just as simple, yet just as important to long-range economy, were developed in studying the power problem. At this plant, as in most others, the high voltage power is furnished by the utility company over aerial transmission lines. Ordinarily these lines end at a terminal pole adjacent to the transformer room, and are brought down the side of the pole in insulated cable, protected by conduit, to a point about 3 feet below the ground. From this point the conduit is led horizontally underground into the building and up the wall to the transformers.

This type of power entrance has frequently given trouble because of condensation inside the conduit caused by the difference in temperatures above and below the frost line. A simple and better method was devised at Triangle to eliminate high voltage line troubles from this cause. The insulated power cable, at a point on the pole about 4

Foresight in installing expanded power facilities provided for two banks of smaller transformers instead of just one large bank. Under proper load conditions either bank can be shut down for cleaning, and should one bank go down, the other maintains service



To avoid trouble from condensation, the incoming high voltage line was taken into the transformer room 4 feet below crossarm instead of led in underground.



feet below the cross-arm, is made to enter a flexible watertight galvanized conduit, about 6 feet long, which curves in a quarter-circle to meet a section of 4-in. rigid conduit at its other end. This rigid conduit runs almost horizontally from the pole to the building, about 10 feet above the ground, but is pitched slightly toward the pole to drain any water or condensation through a small hole at the lowest end.

The rigid conduit is held firmly in place at the building end by being made up into a coupling which was welded to a piece of steel plate, 14x20 inches in size, fitted into one of the upper steel window sash openings. Near its outer end the conduit is strapped to the top of a solid support of 3-in. conduit anchored in a concrete base. The new design saves material, is cheaper to install, and will be easier to maintain.

Similar ingenuity was required when installing the conduit for secondary power cables from the switchgear room to the various sections of the plant. All power cables had to be taken from the panelboard up to the ceiling, and then run closely together and in two layers for a horizontal distance of about 20 feet through a wall opening and into the plant, before separating to their points for distribution. These parallel runs of 30 cables, each in 4-in. conduit, had to run consecutively at two ceiling levels, the first level about 2 feet lower than the second one, because of a difference in ceiling heights, and an obstruction by an I-beam.

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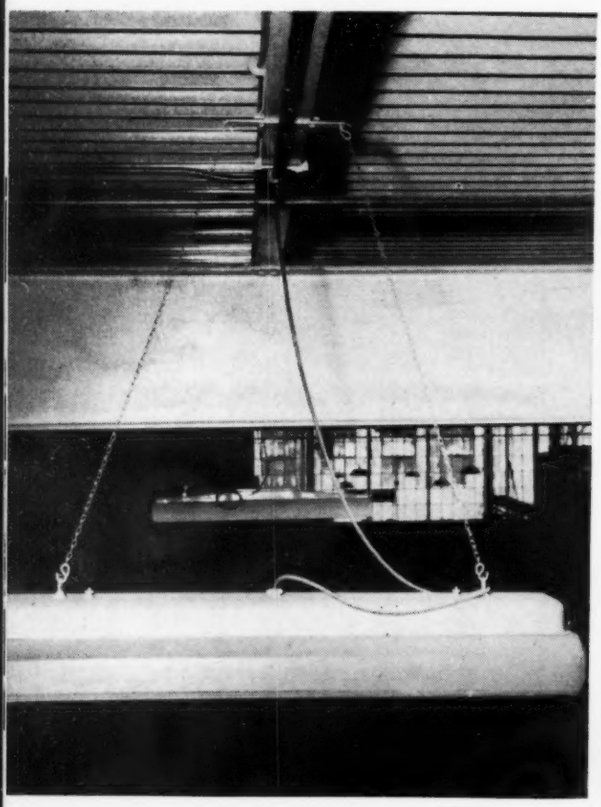
AMONG THE ADVERTISING PAGES, these valuable aids to low-cost production: the plant operation man's guide to **WHAT'S NEW** in **EQUIPMENT** (page 168) . . . a summary of **LABOR DEVELOPMENTS** (page 230) . . . things **YOU WANT TO KNOW** more about (page 222)

At first glance it looked as though the conduit would have to be bent upwards within a space of 5 feet, after passing under the obstructing I-beams, to conform to the change in ceiling levels. Anyone who has attempted a job such as this, working close to the ceiling, knows how long is required, not only to install the heavy conduit, but also to pull the cables.

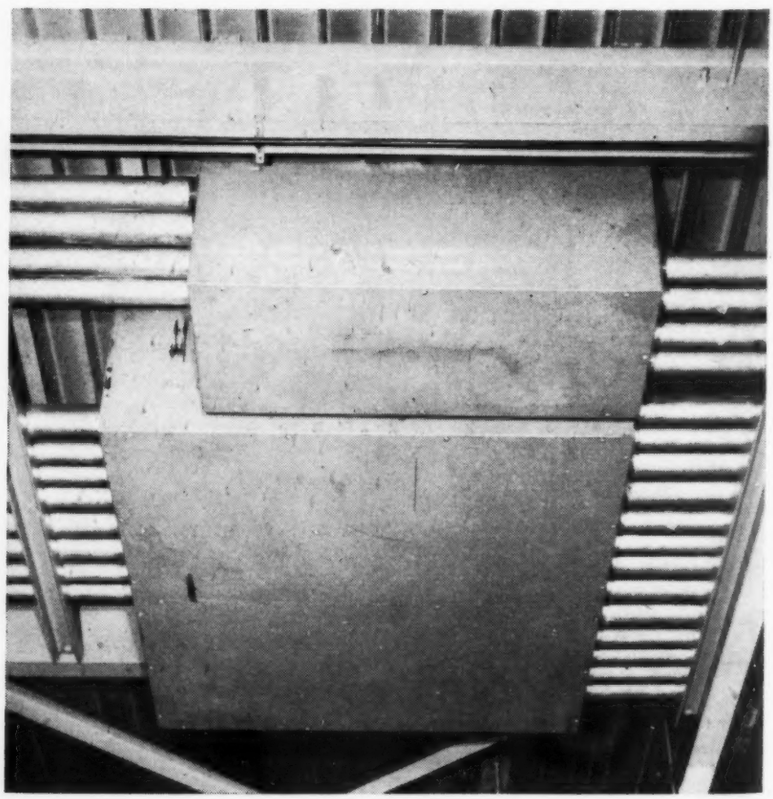
The answer proved a simple one. At the point on the ceiling where the two levels change, a large steel junction box with a bottom cover was installed, about 5 feet long, 4 feet wide, and 3 feet deep. The horizontal runs of conduit from the switchgear room were made to terminate near the bottom of the box on the approaching side. On the opposite side, near the top of the box, the corresponding runs of conduit were made to continue at the higher ceiling level. Thus, all conduit bends were avoided. Instead, the 30 cables were easily pulled into and through the junction box, and were easily bent inside the junction box to follow the change in levels of conduit into and out.

There was nothing very complicated about this or any of the other achievements. In fact, once done, everybody wondered why they had not been thought of before. The reason, it seems, lay in the degree of alertness with which each job was approached. Evidently, when multiplied over a period of years, this alertness will show valuable dividends in smoother production and lower maintenance costs.

Flexible lighting is provided by hanging fixtures from brackets attached to webs of roof beams



The answer to a tough problem in installing parallel runs of cable at two ceiling levels is shown here. Conduit bends were avoided through the use of a junction box



FACTORY MANAGEMENT AND MAINTENANCE • Plant Operation Library No. 96 • August, 1948

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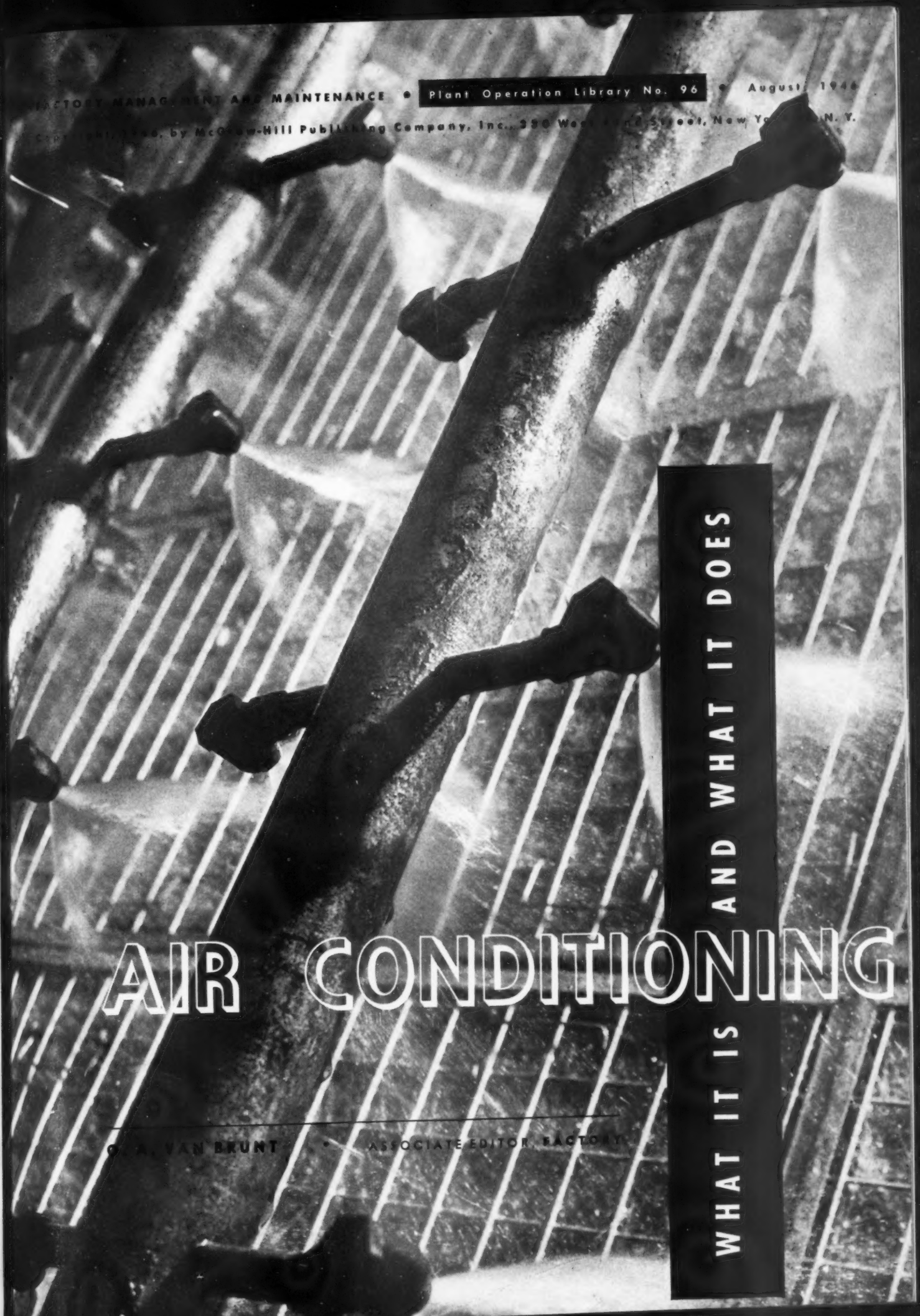
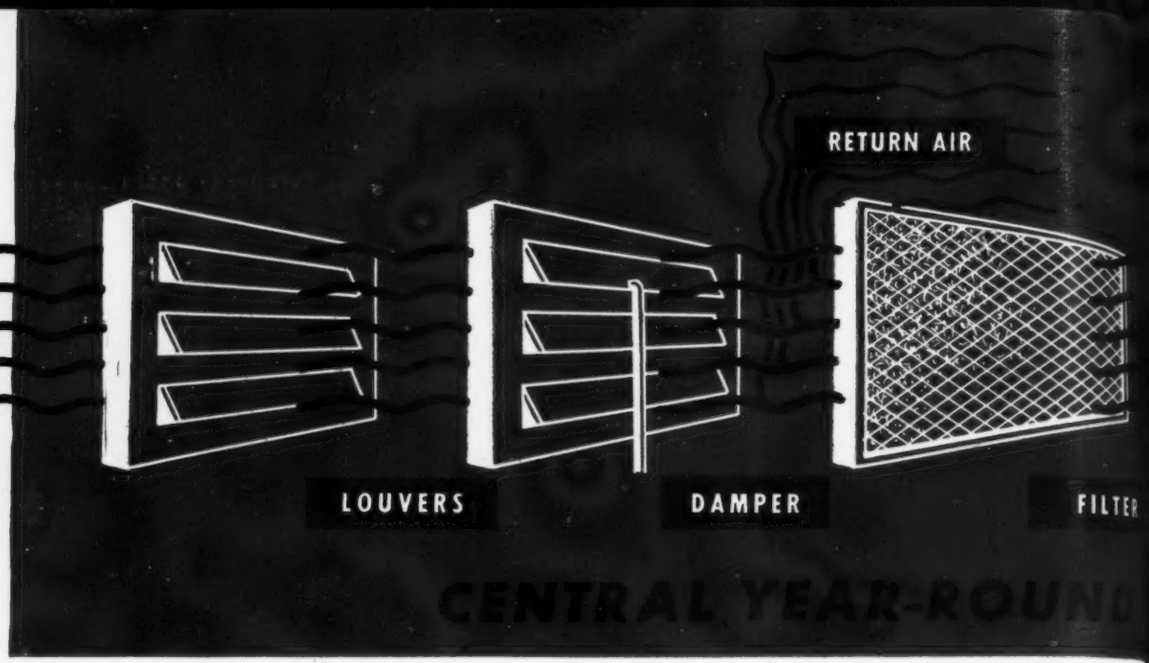


AIR CONDITIONING

WHAT IT IS AND WHAT IT DOES

By A. VAN BRUNT • ASSOCIATE EDITOR, FACTORY

AIR CONDITIONING



For a large part of the time, the air in workplaces must be treated in some way in order to make it produce a feeling of maximum comfort and well-being, or to give it the properties required for highest efficiency in many manufacturing operations. The temperature often is too high or too low for comfort. There is too much or too little moisture in the air for either comfort of workers or efficiency of industrial processes.

Along with these conditions there may be some vitiation or pollution of the air. For example, the oxygen content is slightly decreased and the amount of carbon dioxide increased in the air exhaled by the occupants of a room. Skin and clothing give off odors. In addition, dust, gases, fumes, bacteria, and odors get into the air from one source or another. Hence there arises a definite need for treating air to alter or control its physical or chemical qualities. This process is broadly termed air conditioning.

The treatment that must be given depends on the condition of the air and the qualities that must be imparted in order to make it meet the requirements satisfactorily. Complete air conditioning involves the simultaneous control of temperature, humidity, motion, distribution, dust, bacteria, odors, and toxic gases.

It is not always necessary or desired, however, to control all these qualities. For some industrial processes control of temperature, humidity, or both, is all that is required. On the other hand, the minimum requirements for comfort air conditioning as defined in the ASHVE Code call for the simultaneous maintenance within required limits of temperature, moisture content, movement, and quality of air.

How is air treated to control its quality? What kind of equipment is involved? How does it operate to produce the effect desired?

To control temperature requires suitable means of cooling the air in summer and heating it to the desirable temperature in winter.

Control of moisture content or humidity requires means of adding or removing water vapor.

Filters are required to remove dust and other particles.

Fans are needed to draw in air from the outside, force it through the conditioning apparatus, and distribute it.

Finally, there must be suitable control equipment to direct the operation of the conditioning equipment so as to maintain the desired conditions at all times, within the limits imposed.

CENTRAL SYSTEMS

Where large areas are to be air conditioned, a so-called central system is likely to be used. In such systems all, or most, of the equipment required is concentrated in one place and conditioned air is conveyed to the various areas by ducts.

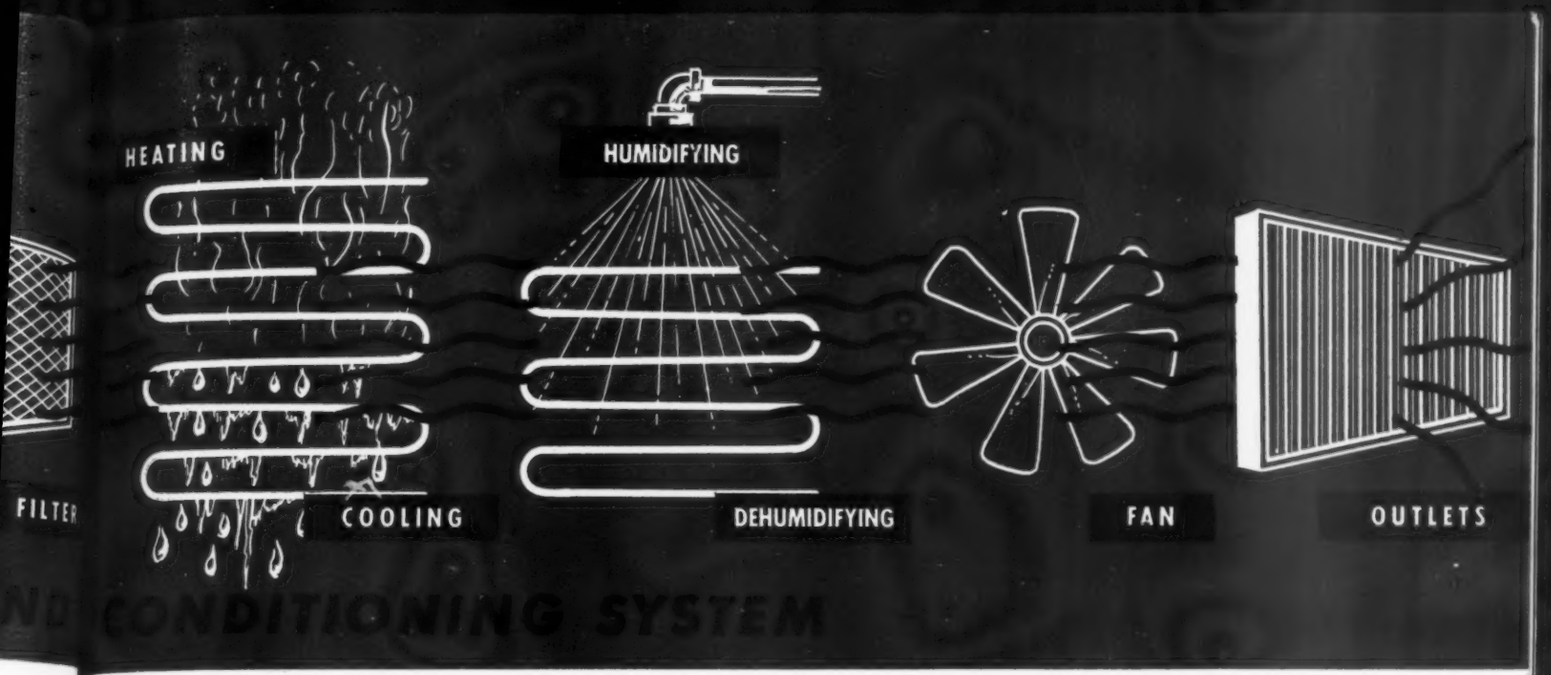
Central systems are subject to considerable variation in design, depending on the characteristics and requirements of the load. For example, it is not feasible to control the air conditioning equipment in large buildings from one spot. Different amounts of heat will be required in the various areas. Differences in the occupancy or processes carried on in various areas will make it necessary to regulate the amount of heating and cooling, humidifying and de-humidifying. Hence heaters and humidifiers, cooling units and de-humidifiers may be required in the individual duct systems for each zone.

These units will be controlled by local thermostats and humidostats, so that any desired conditions can be properly maintained.

UNIT CONDITIONERS

Where the installation of a central system is not necessary or desirable, use is made of unit conditioners. These units are available in a considerable variety of designs ranging from a simple combination of elements for circulating air and cooling it within certain limits, to units that perform all the functions of cooling, dehumidifying, filtering, ventilation, circulation, heating, and humidifying. Units that include a condenser are known as self-contained, whereas those in which the refrigerant is piped from a condenser located elsewhere are designated as the remote type.

The following pages are devoted to a discussion of how air is cooled; how humidity is controlled; and how dust and bacteria are removed from air.



how air is cooled

In air conditioning units the temperature of the air is reduced by bringing it in contact with some medium that is at a lower temperature. In some systems the air is brought directly into contact with cold water or ice, which serves as the cooling medium. More frequently the air is passed over coils through which a refrigerant or cold water or brine flows.

The low temperature necessary to cool the air (also to reduce the humidity) is commonly produced by mechanical refrigeration. This process makes use of some form of compressor, of which three different types known respectively as the reciprocating, the centrifugal, and the steam jet are employed in air conditioning work. The reciprocating type, which resembles an air compressor, is the most familiar.

Instead of compressing air, these machines act on some material known as a refrigerant. The materials that have found widest use include ammonia, methyl chloride, carbon dioxide, dichlorodifluoro methane, and monofluorotrichloro methane.

Use of a compressor to produce cold is based on the simple fact that heat is required to change a liquid into vapor. Practically the process is as follows:

The vapor of the refrigerant enters the cylinder or cylinders of the compressor and its pressure is increased to a suitable value. Its temperature also goes up. The hot vapor then enters a condenser where it loses heat and becomes a liquid. Next, the liquid is allowed to pass through an expansion valve into the evaporator, where it becomes a vapor. As mentioned before, the change from the liquid to the vapor state requires heat, which is absorbed from the evaporator and its surroundings—air, water, or brine.

When air is cooled directly, the evaporator is termed a direct-expansion cooler and the system a direct-expansion system. When chilled water or brine is used to cool air, the system is known as indirect.

After the vapor has passed through the evaporator it enters the compressor again and the cycle is repeated.

It was indicated a moment ago that absorption of heat is required to liquefy the gaseous refrigerant leaving the compressor. This is done in the condenser, cooled by air, water, or both.

An air-cooled condenser is essentially an extended-surface coil that is cooled by blowing air across it.

There are three general types of water-cooled condensers—the double-pipe type; the shell and tube; and the shell and coil. In the double-pipe type water passes through the inner of two concentric pipes, while the refrigerant flows through the space between them.

In all cases the cooling water is wasted to the sewer. Since water is relatively costly in many localities, two methods have been developed for conserving the cooling water.

One method makes use of a cooling tower, wherein the water leaving the condenser is sprayed over a wood lattice work while it is subjected to a current of air produced by fans.

In the other method, use is made of an evaporative condenser. This outfit consists of a finned-tube condenser

Air conditioning helps rayon mill at Scottsville, Va., plant of United States Rubber Company turn out a better product. Here rayon is being ply twisted

enclosed in a housing, a number of water sprays, and a fan that circulates air through the housing. Hence the evaporative condenser is practically a combination of a cooling tower and a water-cooled condenser.

Centrifugal compressors are distinctly different from the reciprocating type in construction and principle of operation. In the reciprocating compressor, the particles of refrigerant are put under pressure by the action of a piston in a cylinder. A centrifugal compressor produces pressure by centrifugal effect, thus using the kinetic energy of the rapidly moving particles of a refrigerant.

Basically, a centrifugal compressor differs little in design from a centrifugal pump. The compressor uses a much higher peripheral speed, however, than the pump. Since the centrifugal compressor is inherently a high-speed machine, it may be driven directly by a motor or steam turbine, or the speed of the prime mover may be stepped up through gears.

These compressors are made in two general types, open and enclosed. As a rule, the open-type compressor is driven through gears and runs at a higher speed than the driver.

Two or more stages usually are required to produce the desired pressure. The refrigerant commonly used in centrifugal compressors is monofluorotrichloromethane (usually termed F_{11}), or water.

Since it would not be economical to pipe the large volume of refrigerant for any considerable distance, the evaporator or cooler is built as an integral part of the compressor. The evaporator chills water or brine which is then circulated to the air conditioning system.

In the cooler, the refrigerant absorbs heat picked up from the load by the brine. This heat becomes the latent heat of evaporation when it changes the refrigerant from liquid to vapor.

The compressor draws refrigerant vapor from the cooler, compresses it, and delivers it to the condenser. At this point the vapor contains the heat picked up from the refrigerating process plus that added by the work done in compressing it to a higher pressure. The condenser cooling water absorbs heat from the hot gas, causing the refrigerant to condense and become liquid, which then flows into the cooler, and the cycle is completed.

STEAM JET SYSTEMS

Use of the steam jet type of compressor is based on the fact that under a high vacuum water will turn into vapor, at low temperatures. Formation of this vapor requires heat, which can be obtained only from the body of water under vacuum. Hence the temperature of the water is lowered, and it is again sent through the cooling coils of the system.

In a steam jet system cool water returning from the air conditioning system is sprayed into the cold tank or evaporator. The pressure in this tank is reduced to a low point—that is, a high vacuum is created—by jets of steam in an ejector. The aspirating effect produced by the jets draws the vapor from the cold tank and forces it into a surface condenser, where it is condensed and withdrawn.

When air conditioning or cooling is done for comfort alone, what is called the effective temperature of the air is the most important matter. The effective temperature is an index that represents in a single value the effect of temperature, humidity, and air motion on the degree of warmth or chill felt by the body. Expressed as a numerical value, it is the temperature of still, saturated air that would produce the same sensation of warmth.

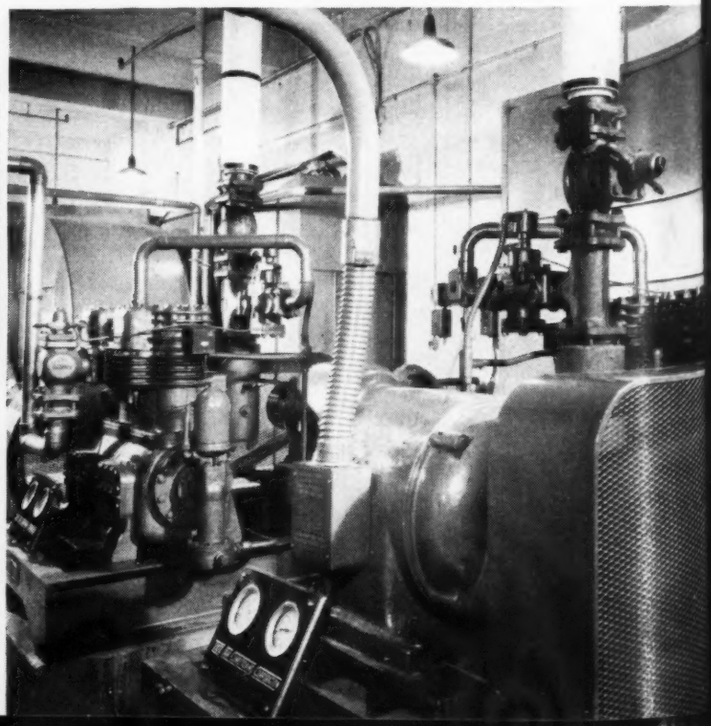
Air may be made to seem cooler by increasing its motion, or by removing part of the moisture content without changing the dry-bulb temperature. Both these methods help to speed up the evaporation of perspiration and thus produce a cooling effect. Bringing a greater volume of air in contact with the skin, through an increase in its motion, also tends to remove heat more rapidly.

Removal of moisture from the air, dehumidification, will be considered later. Here it may be mentioned that there is a very close relationship between air temperature and humidity.

Many industrial processes, however, require that the temperature of the air in a department actually be reduced to some suitable value. Cooling, removal of sensible heat, always is brought about by contact of the air with some surface or medium that is at a lower temperature. In the cooling process, moisture may be added or taken away from the air, or there may be no change.

Ice is sometimes used for cooling air,

Assembling aircraft instruments (left) at Kollsman Instrument Division of Square D Company calls for a constant temperature of 76 deg. F., while relative humidity is kept at 35 percent. The two machines (right) have a combined refrigerating capacity of 80 tons



by blowing it over the ice, or over metal surfaces in contact with it.

When an ample supply of cold water is available, it may be used for cooling air. The water is circulated through coils and the air is blown against and through them. If the temperature of the coil or other cold surface is above the dewpoint, the temperature at which moisture condenses out, only cooling will occur, without change of moisture content.

What is known as evaporative cooling may be employed to reduce the temperature of air within limits that are determined by the capacity of the entering air to absorb moisture.

If air is passed through a spray of unheated water, in an air washer, some evaporation of the water takes place. The latent heat of this vaporization comes from the air, therefore its dry bulb temperature is lowered but the wet bulb temperature does not change. Since the maximum temperature reduction that can be obtained is the difference between the entering dry and wet bulb temperatures, this process of cooling is most effective where the normal wet bulb temperature is low or where the cooling load is largely sensible heat.

MECHANICAL REFRIGERATION

In many air conditioning installations, the low temperature required to cool the air is produced by mechanical refrigeration, employing one of the types of compressors described previously. The air is forced through coils containing refrigerants or chilled brine. As mentioned before, the liquid refrigerant may be allowed to expand directly in the cooling coils—the direct-expansion system—or the refrigerant first chills water or brine, which is then circulated through the air cooling coils.

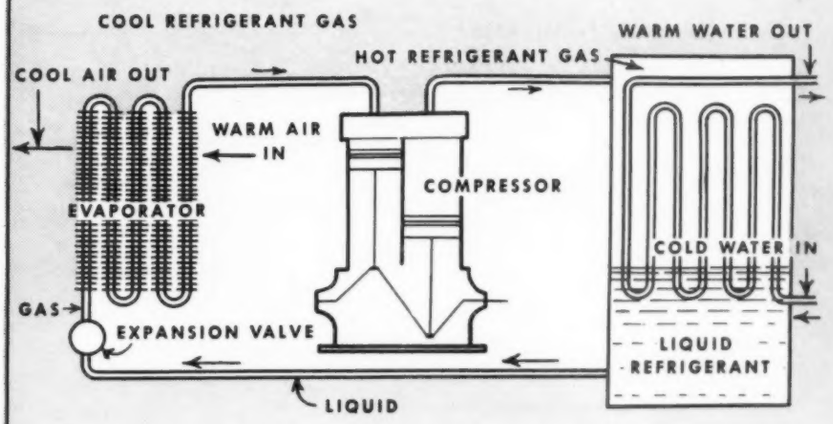
In air conditioning work, the coils for cooling or heating air are practically always of the extended-surface type. Coils through which a volatile refrigerant or water is circulated usually are copper with copper or aluminum fins. Where the circulating medium is a brine, steel tubes are commonly used.

A number of designs of fins are used in extended-surface coils. Some fins consist of circular disks around the pipe. Spiral fins are popular. Other makers use corrugated or flat, square, or continuous fins.

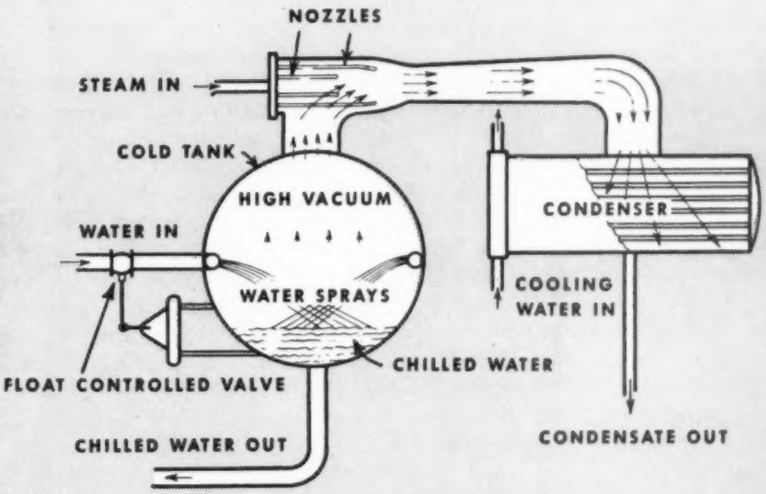
If desired, water-cooled coils can be used for heating in winter by passing hot water through them.

CONTINUED ON NEXT PAGE

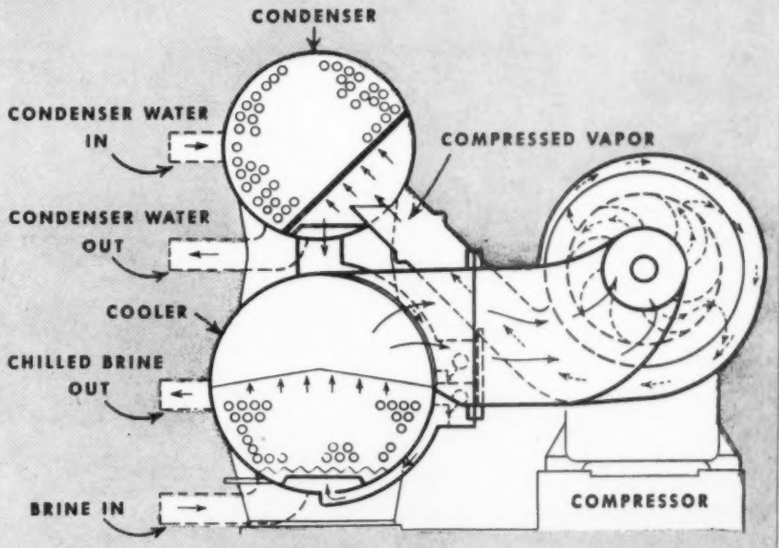
RECIPROCATING COMPRESSOR



STEAM JET COMPRESSOR



CENTRIFUGAL COMPRESSOR



how humidity is controlled

Control of humidity is necessary for comfort and for the maximum efficiency of many manufacturing operations. In most parts of the country the humidity is too high in the warm months, whereas it is too low, or the air is too dry, in winter. Therefore, during part of the year it is necessary to remove moisture from the air whereas at other times the addition of moisture is required.

To understand the methods used in changing or controlling humidity, it is necessary to have certain facts in mind. For example, water vapor in the air must be considered as steam at very low pressure, with properties similar to those of steam. For any temperature there is a corresponding partial pressure of the water vapor at which it is in the saturated state, a condition similar to that of saturated steam. Then the air is also regarded as saturated because it contains the greatest amount of vapor that can be held at that temperature.

As air becomes warmer, it can hold an increasingly greater weight of water per unit of volume. If now the temperature falls below the saturation point, known as the dewpoint, enough of the vapor condenses out to lower the partial pressure to the point where it corresponds to the new temperature. That is why cold water pipes sweat on a hot day when the humidity is high.

Humidity may be expressed as absolute or relative. Absolute humidity refers to the water vapor content in grains per cubic foot. Relative humidity is the ratio between the amount of water vapor in the air to the amount of vapor in saturated air at the same temperature. In popular usage, the term humidity refers to the relative rather than the absolute expression.

If air is heated, the relative humidity decreases since the amount of vapor in a given volume does not change, whereas the amount that could be held increases.

Reference is often made in air conditioning work to dry bulb and wet bulb temperatures. Dry bulb temperature is the one shown by conventional thermometers or other atmospheric temperature indicators.

The wet bulb temperature is obtained when a cloth sleeve is placed over the bulb of a mercury or similar thermometer, wetted with pure water, and air passed rapidly over it. Except when the air is saturated, it will absorb the moisture evaporated from the wet sleeve. Since evaporation is a cooling process, the wet bulb temperature is always lower than the dry bulb except in saturated air. The drier the air the faster evaporation from the sleeve takes place, and the lower the wet bulb temperature.

When it is desired to reduce the humidity, use is made of one or both of two general methods. In the first method the air is chilled below the dewpoint. The other method depends on the ability of certain substances to abstract moisture from the air.

Lowering of the dewpoint may be brought about by passing the air over a cold surface, for example the cooling coil described before. The lower the temperature to which the air is cooled, the greater the amount of moisture that will be condensed out of it.

Where close control of temperature and humidity or low values of relative humidity are required, it may be necessary to cool the air to a lower point than is desirable in order to produce the required humidity. One way out of this difficulty is to warm the air afterward.

SPRAYING THE AIR

Another method of lowering the dewpoint involves spraying the air with cool water, which usually has been chilled by a refrigerating machine. Moisture removal may be accomplished by this method as long as the temperature of the spray water is kept below the dewpoint temperature of the entering air. The dewpoint can be positively controlled by adjusting the temperature of the spray water.

Basically, the spray-type dehumidifier or air washer is simply an enclosed chamber through which air passes and is made to come in intimate contact with water. The lower part of the chamber is a sump in which the water collects. It is pumped out of the sump and recirculated through the cooling system before being used again.

Close contact between the water and the air is obtained by producing a fine mist with suitable nozzles arranged in one or more banks; by passing the air over wet surfaces; or by a combination of these arrangements.

The direction of the spray may be with the air stream, against it, or a combination of both.

Outgoing air is forced to pass through eliminator plates that cause several changes in the direction of flow. Their purpose is to remove any droplets of water from the outgoing air.

Many instances arise, however, in which it is desirable or necessary to use some other method of controlling humidity, either alone or in combination with those described. Thus, unusually low humidity may be required, or it may be necessary to control humidity inde-

Humidifiers, between the columns, keep proper value of relative humidity in this southern textile mill. Humidity plays an important role in the textile industry

pendently of the temperature. Recourse is then had to certain materials known as sorbents that have the ability to remove moisture from the air.

Sorbents are of two general types, adsorbents and absorbents.

Adsorbents present a large amount of internal surface formed by extremely small pores to which water will adhere or is adsorbed. Silica gel and activated alumina are among the best-known materials of this class. The material itself does not undergo permanent change.

Absorbents are materials that can take up water vapor but in so doing they undergo physical or chemical changes, or both. Some of these materials, for example calcium chloride, are solids, whereas others are liquids—solutions of certain salts.

Both types of sorbents eventually become saturated, so to speak, but can be reactivated by heat.

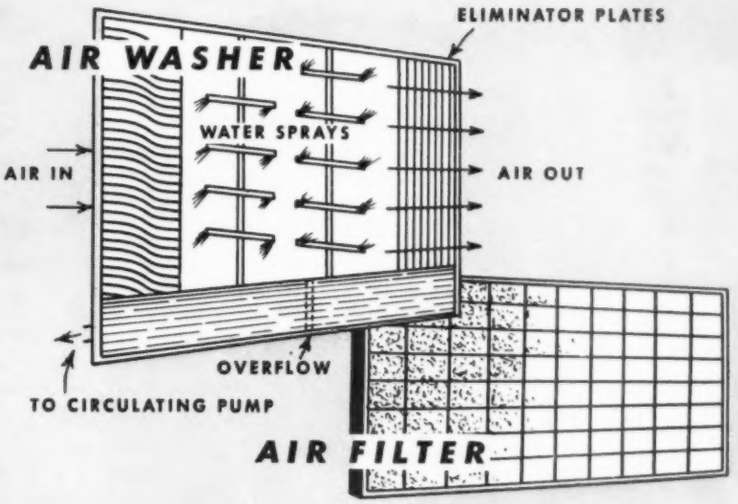
A dehydrator using solid drying agents consists essentially of a rotating or stationary bed or a series of stationary trays containing the material, fans to handle the air that is to be dried, a gas-fired, steam, or electric heater for reactivating, and the controls necessary for continuous automatic operation.

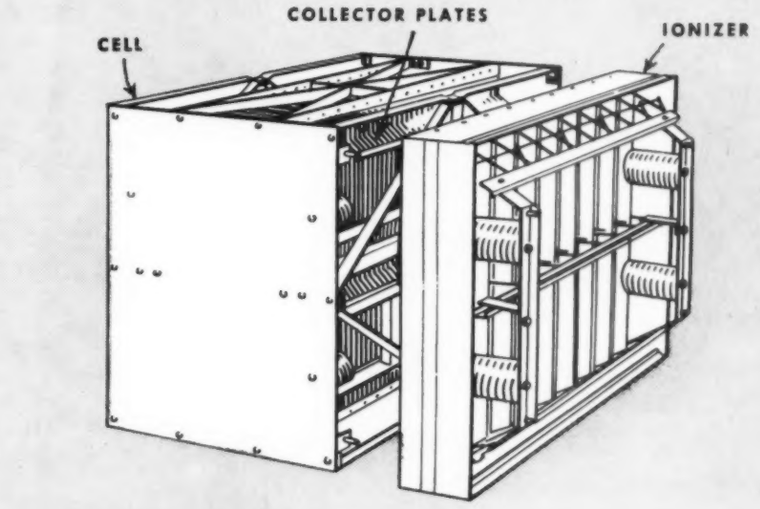
DRYING, HEATING AIR

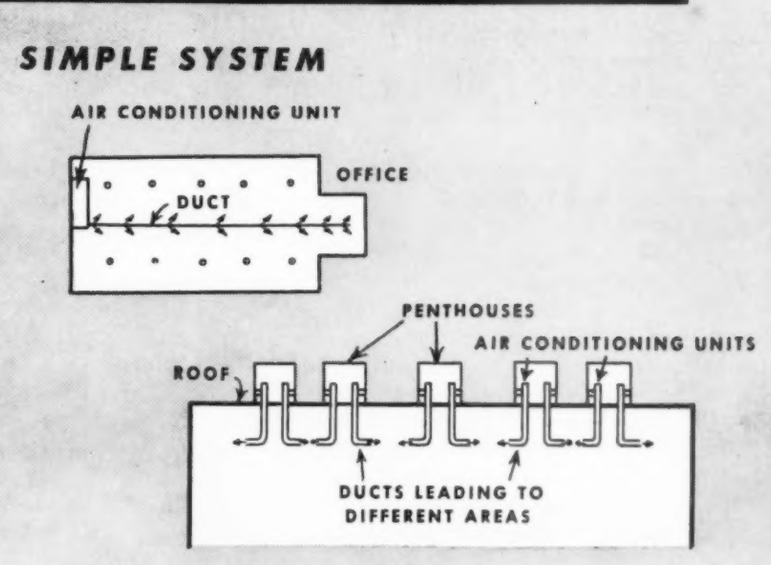
In one design of bed-type dehydrator, a cylinder filled with the drying agent rotates continuously. In another design the cylinder is stationary and a rotating damper serves to direct the air flow as desired. In both instances, three streams of air are directed through the material. One stream is the air to be dried. The second is air heated to 300-350 deg. F. for reactivating the portion of the drying agent that has been saturated. A third stream cools the reactivated part of the bed.

Two complete sets of stationary trays or beds containing a solid drying agent are used in one design of dehydrator. Automatically controlled dampers are arranged so that one set of beds is always being reactivated by a stream of hot air while the other bed is absorbing moisture from the air to be conditioned.

When liquid sorbents are used for dehumidification the air to be dried is brought into contact with a water solution of the material used. The moisture removed from the air dilutes the absorbent solution and has to be removed in a solution concentrator, which is a low-pressure-steam heat exchanger. Moisture removed from the solution is dis-







MULTIPLE SYSTEM

charged to the outer atmosphere. The concentrated brine is then pumped to the main reservoir for re-use.

Control of the temperature of the air leaving the dehydrator is accomplished by precooling the absorbent.

Instead of removing moisture from the air, however, it is often necessary to add more. For example, in winter the air usually is too dry or the humidity is too low for either comfort or health. Again, some industries require for certain operations a higher relative humidity than is normally found.

Humidification is a relatively simple process and may be accomplished in several ways. The use of an air washer, in which the air is subjected to sprays of water, for dehumidifying air, has been described. An air washer may be used also for humidification. With it humidity may be increased simply by spraying the air with recirculated water. Or the air may be preheated and sprayed with recirculated water. Again, the air may be sprayed with water heated to the temperature necessary to produce the desired result.

DIRECT HUMIDIFERS

Another general method of increasing the humidity involves the use of some type of direct humidifier, of which there are a number. Use of a steam jet is an old and well-known method of introducing moisture.

All the other types of direct humidifiers work on the principle of breaking water up into fine droplets that are thrown or blown into the air, or wet surfaces of comparatively large area are exposed to the air.

If anything like close control of humidity is required, it is necessary to install a humidostat. A common form of humidostat makes use of human hair, a strip of treated paper, or a piece of wood—all materials that respond to changes in the humidity of the air surrounding them—to open or close contacts. These contacts in turn control relays through which valves or dampers of the system are operated.

Another type of humidostat that operates on a different principle consists of two thermostatic elements. One element controls the dry bulb temperature while the other is kept wet by a wet cloth sleeve or spray and controls the wet bulb temperature. By controlling both temperatures at predetermined ratios, the relative humidity can be kept close to constant.

how air is cleaned

It is usually desired to remove dust and bacteria from conditioned air. Passing air through a water spray, as in an air washer, will take out a large part of the dust and dirt. Some form of filter, however, is usually employed to clean the air, while an air washer is used primarily to cool, humidify, and dehumidify it.

Several types of air filters have been developed in a variety of designs. The simplest consists of some dry fibrous or fabric-like materials or a porous composition paper held in a frame made of metal, fiber, cardboard, or wood by a wire mesh or expanded metal. These frames are then arranged in banks on a suitable framework.

Some filters of this type are intended to be discarded when too dirty for further use. A good deal of the dirt can be removed from others by rapping or jarring.

With another design, one or more layers of the filtering medium can be replaced and the filter made ready for service again.

The principle of catching air-borne particles on a wet or sticky surface is used in the so-called viscous impingement type filter. These filters are of two kinds, automatic and non-automatic cleaning.

Several different fibrous materials—glass fiber, steel or other metal wool, hair, vegetable fibers—are used in unit filters of this type. The frame usually is metal. The filtering medium is wet with some suitable liquid.

The automatically cleaned filter is essentially a series of metal plates attached to endless chains that run over sprockets arranged in the vertical plane. The plates form a continuous curtain, moving up one side and down the other. At the bottom the plates dip into an oil bath that removes the dirt adhering to them and coats them afresh. Automatic control usually is provided to move the curtain at suitable intervals.

Movement may also be controlled by a pressure switch actuated by the resistance of the filters to air flow.

During the past few years the electrostatic precipitation of air-borne particles has come into increasing use.

Air entering such a unit passes by wires that are kept positively charged at a potential of about 13,000 volts. The electrostatic field thus produced charges all particles floating in the air. The air stream then passes between collector plates carrying a negative charge at about 6000 volts. The positively charged particles are attracted to and held on the negatively charged collector plates until washed down and removed.

A filter that has recently been developed uses a collector element made of special paper. It is built up of porous tissue-like plies of short cellulose fibers arranged haphazardly. When an electrostatic charge is applied to the collecting element the plies tend to separate and each fiber attracts and holds dust and other particles.

When the paper has accumulated a load of dust it is replaced with clean paper by turning the crank of a mechanism that forms part of the filter.

DELIVERING THE AIR

After air has been suitably conditioned, the final step is delivery to the proper area. For that purpose, ducts are required to form channels for the air, with fans or blowers to force it along.

Ducts usually are made of galvanized-iron sheets formed into round, square, or rectangular sections, as best suit the conditions.

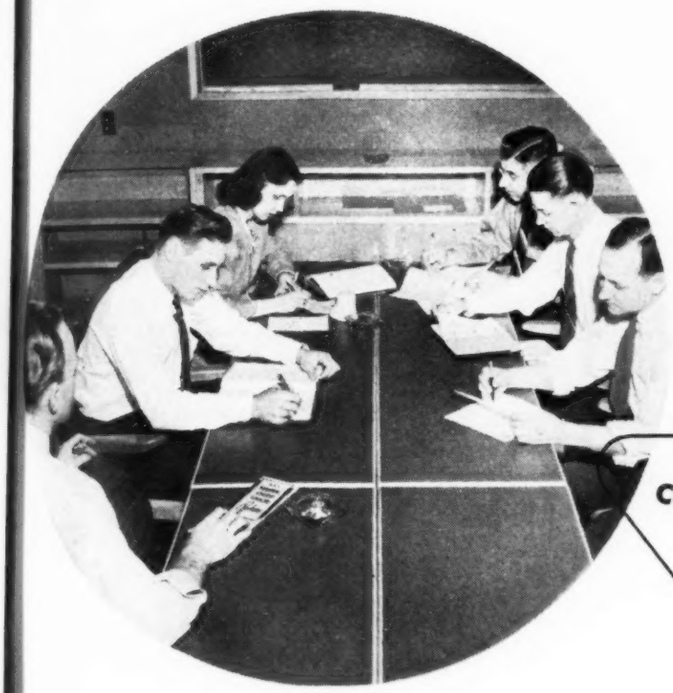
Fans and blowers are of two general types—the axial flow or propeller, in which the direction of flow is parallel to the axis; and the radial flow or centrifugal, in which the direction of flow is at a right angle to the axis.

Axial flow fans are made in a considerable variety of designs and sizes. The blades may be cast or made of sheet metal, and may be flat or shaped. Blade angle varies widely.

Centrifugal or radial flow fans are of two general designs, those having forward curved blades and those in which the blades are curved backward. There is considerable diversity in the curvature, proportions, and angularity of the blades, brought about by the necessity for meeting many different requirements and operating conditions.

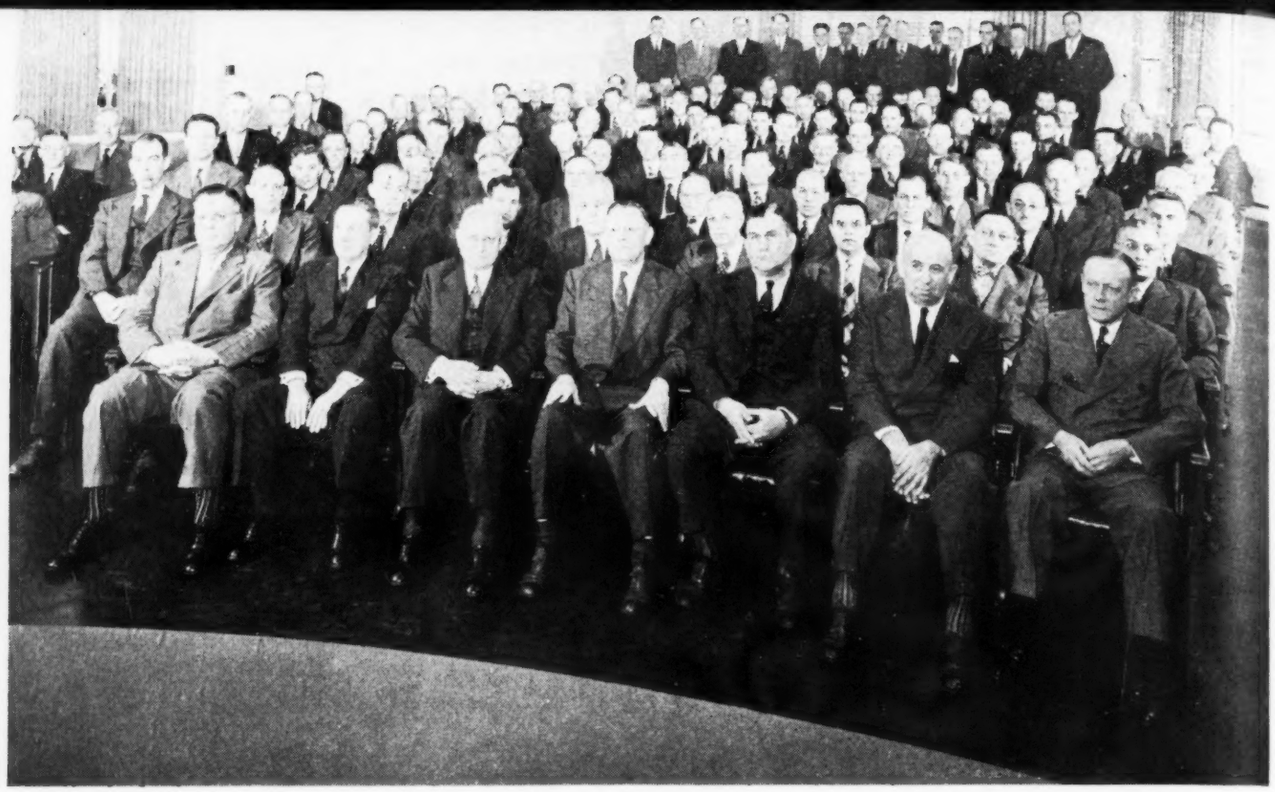
THREE-PURPOSE CONFERENCE ROOM

WILLIAM HASSELO • PLANT ENGINEER, CONTAINER CORPORATION OF AMERICA, CLEVELAND



CONFERENCE ROOM TO LECTURE HALL TO CLASSROOM

A small conference room at Container Corporation of America is used for three different purposes. This is made possible by a table of unusual design, which allows quick change from conference room to lecture hall or to classroom. The table, whose over-all dimensions are 3x12 feet, is built in four sections. Pushed together, the sections make a conference table for foremen's meetings or committee use. With the sections pushed against the wall, there is space for seats in the center of the room —and you have a lecture hall. For a classroom, table sections are arranged in rows, with plenty of room in each section for three persons.



ALL MEMBERS OF MANAGEMENT—FROM JOB FOREMEN TO PRESIDENT—MEET WEEKLY TO DISCUSS CURRENT PROBLEMS

SUPERVISORS KEPT IN THE KNOW BY WEEKLY GET-TOGETHER

W. E. BAHL • FACTORY MANAGER, THE NATIONAL CASH REGISTER COMPANY, DAYTON, OHIO

All members of management—from job foremen to president—sit down together once a week at The National Cash Register Company. This weekly meeting keeps everyone informed on all phases of company operation.

Future expansion or operational plans are discussed in detail, with reasons given when it appears necessary or desirable, so that the management employees are fully cognizant of such plans and can interpret them to rank-and-file workers.

Recently appointed job foremen are introduced, and their duties are described in general. A foreman whose monthly report of operations has divulged an interesting problem may be called upon to elaborate, and other members are asked for possible solutions. If a foreman's report shows up a noteworthy achievement, he is commended at the meeting.

When a new system for production control, scheduling, maintenance, or the like, is to be put into effect, the originator explains the details and answers questions about the system.

Each department has an "output board" on which the previous day's production is compared with the scheduled daily production and with the average daily production for the previous month. Records appearing on these boards make for lively discussion, because a poor record in one department may have been brought about by another department's failure to provide parts. Thus many problems of poor distribution or poor scheduling are uncovered, which might otherwise go unnoticed. Corrective action can be taken promptly—and there is, in fact, an incentive to correct faults when the initial complaint is made, rather than have it brought up for discussion at the weekly meeting.

Heads of non-productive departments are called in from time to time to talk about matters that are either directly related to production or that need to be known from an educational standpoint. The head of industrial relations, for instance, may be asked to clarify the seniority rule, as it applies to inter-departmental transfers. Or the sales manager outlines the sales outlook for the various types of machines being made. Other officials discuss newly developed machines, and explain the functions they will perform. Costs for a particular operation, and the various phases of piecework or daywork, may be explained by the supervisor of standards and cost control.

In addition, at each meeting a department head describes some particular phase of the operations in his department. In this manner, each member of management gets a picture of the operations and problems of all departments in the plant.

THESE DEAF-MUTES ARE GOOD FACTORY WORKERS

B. M. SCHOWE • LABOR ECONOMICS SPECIALIST, FIRESTONE TIRE & RUBBER COMPANY, AKRON

Employment offices in Akron tire manufacturing plants have been hiring deaf (mute) workers for more than 30 years as a matter of daily routine. These employees do many types of work—in machine shops, steel rim plants, laboratories, and offices, as well as on a considerable range of occupations in the production of rubber goods.

It follows that deaf workers can be just as usefully employed in many other industries if all the angles are properly considered. With some thousands of boys whose hearing has been impaired returning from overseas, personnel men in all industries can approach the problem of employing them more confidently in the light of Akron experience.

Deafened servicemen will not be deaf-mutes in the common understanding of that term. They will generally have normal speech and will read lips to some extent. Nevertheless, basic principles of employment will be unchanged.

Some adjustment of perspective may be the first step. Deafness does not fit easily into classification for employment purposes. It ranks as a physical disability, but it is a disability without any impairment of strength or dexterity. The only handicap common to all deaf persons is a severe, but not impassable, rupture in their line of communication. Instead of communicating by means of sound signals (chiefly speech), they must rely on visual signals—hand, lip, and writing.

How, then, can one conduct a successful employment interview with the deaf when the normal channel for the exchange of information is blocked out?

It is easy to get off to wrong assumptions with lip reading. This art is often overrated. Routine questions as to age, weight, and previous employment must rely on visual signals—hand, lip, reader, but there may be trouble with technical questions, introducing words and figures of speech that are unfamil-

Deafness is a disability without any impairment of strength or dexterity

iar. Even the best lip readers—and good ones are rare—will simulate understanding and acquiescence when they do not fully understand, in the honest, but often vain, hope that as the speaker proceeds his remarks will throw light on the half-understood passages.

How much the interviewee does understand and how accurate his replies are, are often open to doubt. The safe and time-saving procedure is to write.

However, even writing will not insure a satisfactory interview with every deaf person. Those who have lost their hearing in infancy face a tough assignment in the study of English. Not all such students are equally successful.

For deaf persons in the above category, language deficiency is not a true measure of intelligence and ability. Their sign language, like the native tongue of the foreign born, may have served as the vehicle for mental development far beyond the reaches of their English vocabulary.

In the Akron rubber companies there are interviewers in the employment offices who can use sign language and who are familiar with the vocational background of deaf workers as a group. The services of such a specialist are a mere convenience. The average employer, who will have occasion to hire no more than a score of deaf workers over a period of years, can make placements with every prospect of success by means of a judicious use of pad and pencil.

Occasionally, the employment interview will be complicated by the appearance of a deaf applicant with an "interpreter" to act as go-between. This is usually a handicap, for it may obscure an insight into the personality and temperament of the prospective employee and preclude the testing of methods of communication that may be required on the job, where the interpreter will not be present. When contact can be established only through a third person the interview is a blank.

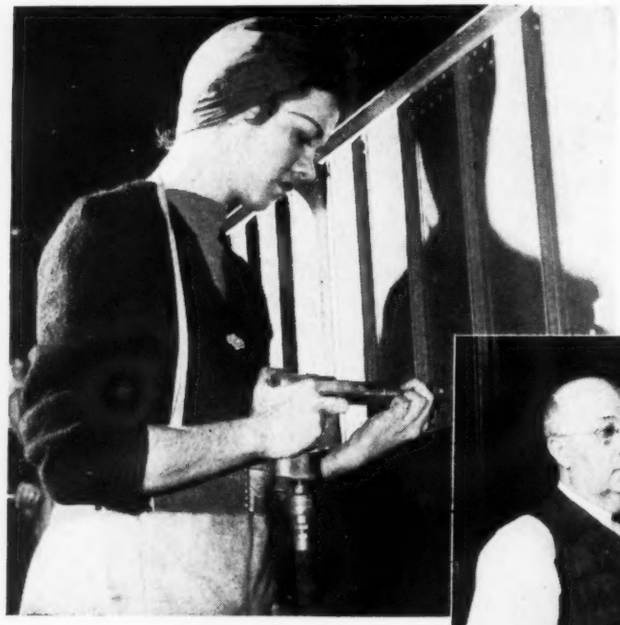
Time and again the interview with more experienced and intelligent deaf workers will be as smooth and almost as swift as with hearing workers. The only deviation from normal will be a few notes jotted on a pad. Only in exceptions will there be complications.

Like a golf swing, the business of assigning deaf employees to suitable jobs is not too tough if you just relax and follow through with uninhibited momentum. Start with the reasonable assumption that deaf workers are innocent of disqualifying disabilities for any given operation unless proved guilty.

One common fallacy credits the deaf with qualifications they do not possess by assuming that deaf workers are immune to the irritation of noise and can therefore be used to good advantage on noisy jobs. This simply is not right. Many deaf persons are actually hypersensitive to the irritation of noises that they perceive.

No deaf person should be assigned to a noisy job simply because he is deaf. The same precautions should be taken that are observed with hearing workers. Be sure the individual considers himself immune. Some can take it; some can't.

Jobs classified as common labor are rarely suitable for the deaf. Deaf workers without special trade skills are usually most successful as machine operators and bench hands, where manual dexterity is a prime requisite. The crit-



Even light riveting can be too noisy for some deaf workers. This girl is indifferent to the noise, is an expert operator

Interviewing a deaf applicant can be simple and satisfactory. It involves merely using a pad and pencil instead of speech

ical test should be: Does deafness impose any additional risk? The jobs on which sound perception is essential are not hard to spot and there is less danger that deaf workers will be misplaced on this account than that their range of usefulness will be needlessly circumscribed by unfounded fears.

NO NEED TO SEGREGATE

The segregation of deaf workers under specially qualified supervisors has been tried in Akron and elsewhere with only indifferent success. The aptitudes of deaf workers are too varied to be channeled in one direction. The safe rule is to make assignments under congenial foremen on a basis of qualifications for the job. The one outstanding fact is that any foreman or supervisor who is willing to make the experiment with deaf employees is almost sure to be successful with them.

During the breaking-in period more than a normal amount of written instruction is required; but although experience indicates that it takes more time and more patience to break in the deaf worker, the foreman who has taken pains with the task can expect, under normal circumstances, a dividend on his extra effort in the form of loyalty and dependability.

Sometimes this loyalty fails to develop and a complaint is made that the deaf worker is temperamental and uncooperative. The circumstances usually fall into a familiar pattern. The foreman has not had the time, or has not taken time, to explain why certain jobs have been assigned, and the deaf employee has interpreted the situation to mean that his services and his seniority have not received the recognition that he thinks they merited.

Of course, it is not uncommon for hearing workers to nurse a similar grievance, but it should be understood that deaf workers are even more exposed to misunderstandings in this general neighborhood. They may have missed some of the shop talk that would have explained matters.

This does not mean that deaf workers are cut off from the flow of life in the shop. Many of them play on the department bowling and baseball teams. Generally they enter into all activities with hearty good will.

When there is lack of cooperation, the waywardness is usually rooted in pride. It is characteristic of the deaf to take a fierce pride in their manual dexterity.

Sports are important to the deaf. Seldon Cook has a bowling average of 175 in one of Firestone's interdepartmental leagues

An arbitrary assignment that seems to be a reflection on their skill and ability will frequently be resented. But such pride is an asset when properly cultivated. It is an incentive that inspires them to excel as workmen.

Vocational education is featured in all state schools for the deaf, and young deaf people usually start adult life well grounded in basic skills that are adaptable to a variety of operations in mass production industry. Deaf employees make good progress when enrolled for in-plant training courses.

Specific accident hazards, such as traveling crane with a warning sound signal, are generally less hazardous in practice than in theory. In theory it is necessary to hear the signal or run the risk of being caught under a loaded crane.

However, with the exception of cautious side trips for loading and unloading—and then everyone is warned to leave the danger zone—the crane moves only down the center aisle. The simple precaution for the deaf in such instances is to keep safe without relying on any signal. The center aisle must be avoided as much as possible, or when it is necessary to cross it, position of the crane must be checked. Such practice in taking precautions is routine in the discipline of the deaf.

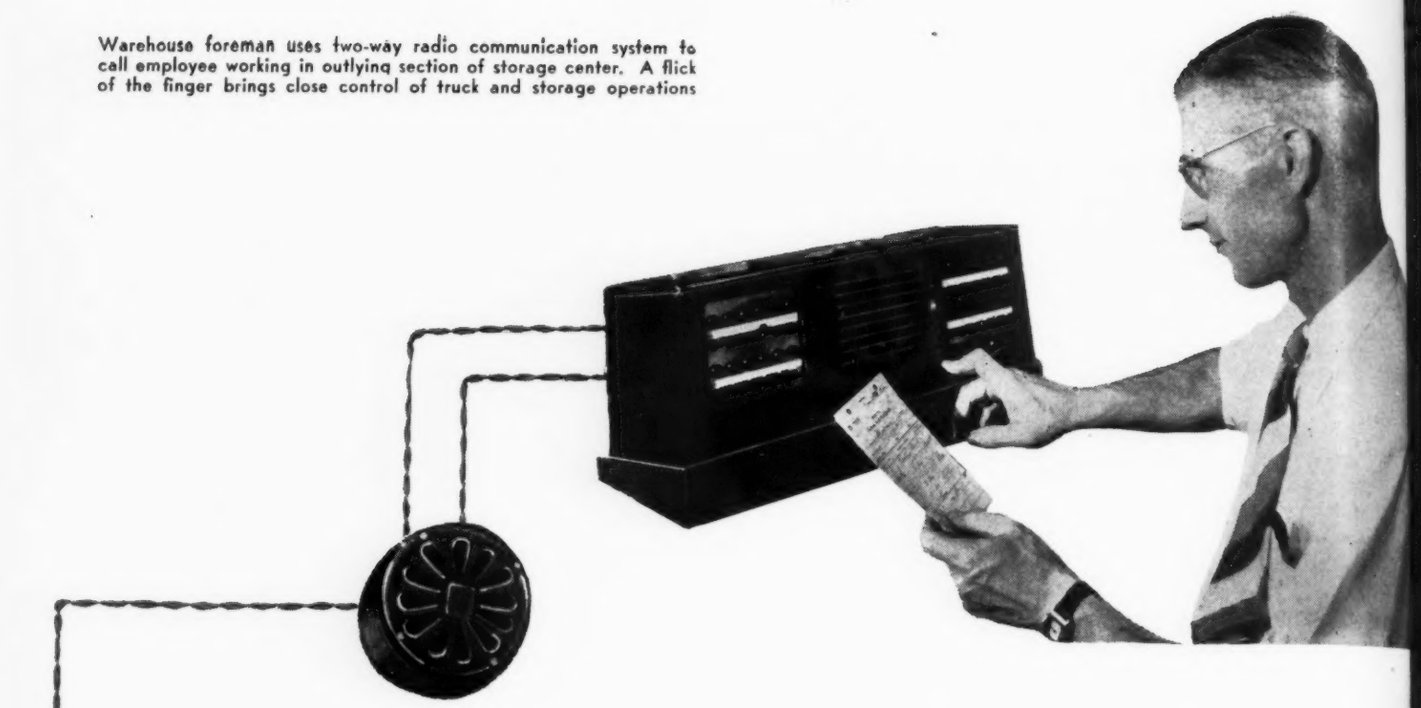
The fact is that there are nearly 50 different workmen's compensation laws in the United States (the District of Columbia also has one) and there is no provision in any of them that might cause an employer to hesitate over the employment of a deaf person.

Neither the tax rate nor any obligation of the employer under the various statutes will be affected by the employment of deaf workers.

If this statement is questioned, it can be on no other ground than that so-called "second injuries" may be an excessive liability under provisions of the laws in some states. But workers are immune to "second injuries" so far as their deafness is concerned. Even though a deaf worker should suffer severe injury on the job, such as loss of an arm or even blindness, no additional compensation would be due him because of deafness.

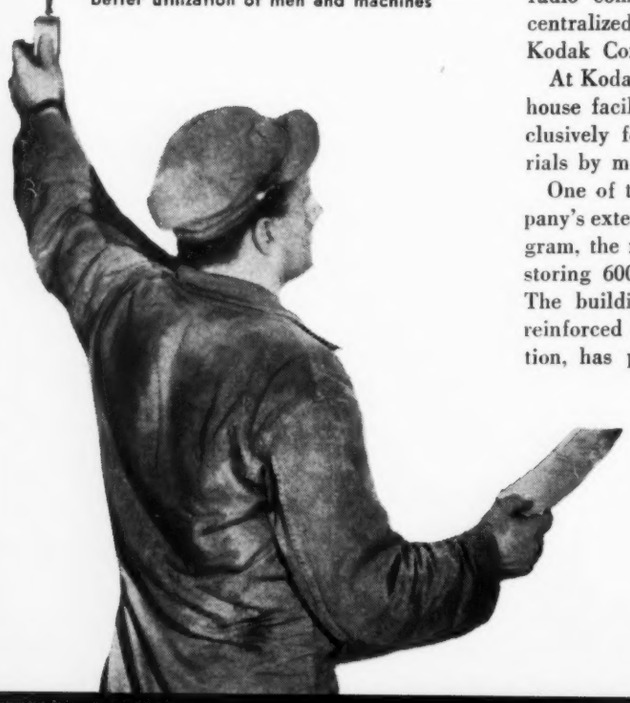
Like workmen's compensation laws, standard group insurance policies—life, health, and hospitalization—make no distinction between deaf workers and other workers.

Men responsible for insurance, workmen's compensation, and safety administration in plants where there is a long history of employment for deaf workers are unanimous in the opinion that deaf workers may be safely employed as long as they are assigned jobs carefully and with reasonable discretion.



Warehouse foreman uses two-way radio communication system to call employee working in outlying section of storage center. A flick of the finger brings close control of truck and storage operations

TWO-WAY RADIO SPEEDS PALLETIZED STORAGE



Employee hears call from foreman and replies from where he is working. Result, better utilization of men and machines

Palletized handling and two-way radio communication highlight a new centralized storage project at Eastman Kodak Company, Rochester.

At Kodak Park Works, modern warehouse facilities have been designed exclusively for the storage of raw materials by mechanical methods.

One of the first projects in the company's extensive post-war expansion program, the new warehouse is capable of storing 600 carloads of raw materials. The building is entirely fireproof, of reinforced concrete and brick construction, has pre-cast concrete roof slabs.

There are six rooms of equal size, each containing 24,500 square feet of space. Ceiling height is 17 feet. Bays are 20 by 40 feet. Wide aisles provide large operating areas free of column interference.

Each room has two doors on either side, making a total of 24 doors in the entire construction through which trucks can operate in loading and unloading material. Railroad sidings flank both sides of the storage building and make it possible to spot 24 carloads of freight at one time.

A two-way radio communication system keeps office personnel in constant contact with men working in any part of the building and assures proper coordination of storage operations.

An outstanding feature of the warehousing technique is mechanized handling of all freight through the use of wood pallets and a fleet of twelve power-operated trucks, with capacities ranging from 2000 to 5000 pounds.

Wide aisles and lack of column interference speed mechanical loading and handling of stock. Because of the urgent need of space, each room was occupied as it was finished

Lift truck operator, protected by guard frame, places a load of freight. All stock is palletized and handled by fork lifts. Maximum use is made of vertical storage

As shipments are received, the materials are stored on pallets and moved directly from the car to the warehouse where they are stacked on top of one another to the maximum height. When deliveries are made, these pallet loads are removed by the fork trucks directly to the freight car or Kodak truck for transfer to manufacturing departments or processing areas, which are similarly equipped with mechanized facilities.

Complete modern facilities for the men employed in the warehouse include lavatories, toilets, locker room, and showers, making it a good place to work.

Six months ago FACTORY'S editors sensed today's rapidly increasing interest in public relations—and the growing demand for know-how that would enable industry to do a good public relations job. They gave Millard C. Faught, economist and public relations counsel, an assignment to study and report upon leading jobs being done in industry. Here is the report

HOW DOES YOUR COMMUNITY LIKE YOUR COMPANY?

Many a company with a glamorous national personality, built on a famous product or dramatic advertising, may still have "B-O" in its own hometown, simply because it overlooks the little things that make a company a good citizen and a friendly neighbor.

On the other hand, there are scores of companies, big and small, which make unglamorous things like glue or cotter pins, yet these companies' workers and the folks in town are proud as punch about *their company*. What's more, they'll go out of their way to do or say a good thing for the company and its products because they know the company will do the same for them and their town.

The difference between these two situations is invariably a matter of good or bad company public relations—or to use a more specific term, good or bad *plant-city relations*.

In lawyer language a corporation is a "legal person" which can own property, buy and sell goods, sue and be sued. By the same kind of rationalization it has become recognized that corporations or companies have *personalities*. Like people, they can be "regular guys" or "stinkers" depending on how they impress their associates in the world of other persons, both corporate and human.

Nowhere does this characteristic of a company's personality show up more than in its own hometown—which is only natural since a company, irrespective of its size or what it produces, is a citizen and a neighbor in its community. Frequently, in fact, a company is *the most important citizen* in a community, and what it does and how it acts is of direct interest to every other citizen. It is small wonder that companies acquire "local citizenship" problems; but it is great wonder that some companies seem so confused about how to act like good citizens of the towns they live in.

American enterprise is well into a phase of *decentralization*. That is, we are getting away from the company policy of having one whopping big plant; instead, we are tending more toward the "home office" with numerous subsidiary plants scattered about the country.

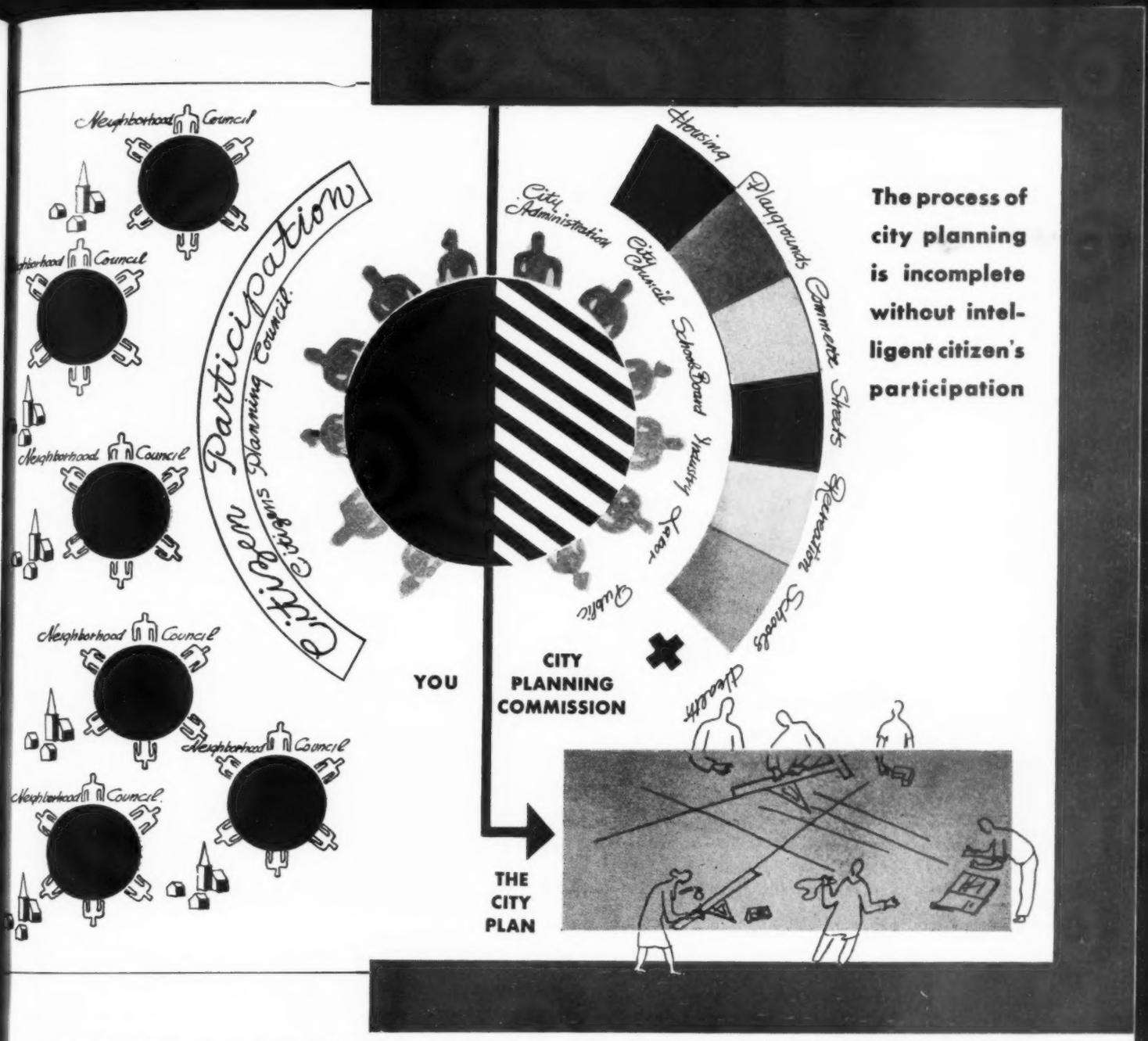
"SPLIT PERSONALITIES"

This development adds a special twist to plant-city relations because the outlying units of such a company have "split personalities." Their bodies are in the communities where they exist, but part of their vital organs are retained at the home office, somewhere else. As a result, they frequently have to "check with headquarters" before they do even an ordinary good-citizen-like thing such as kicking in to the Hometown Boosters' Annual Picnic Fund. And all too frequently the home office doesn't seem to give a hoot about such things in the everyday life of the East Centerville Parts Division. As a result the manager of the branch plant hates to be seen in the Community Church next Sunday (unless he has dug into his own pocket), and what his friends at the Boosters' Club think of him is only exceeded negatively by what he thinks of the home office.

America hasn't got so big nor life so complicated but what everybody still has a Hometown—and what's more, we all still have "our" neighborhood. America continues to be a nation of *communities* and business enterprise would do well to rediscover this humble fact. It can be turned to enormous advantage in practicing a company's public relations with its workers, its stockholders, its customers, and with "the public" who run the United States.

Companies locate and live in communities for much the same reason that other "persons" do—for reasons of group-service, security, etc. And the better a community serves its *human citizens* with factors of public services, health, recreation, schools, and good government, the better it serves its *company citizens*. No company can have greater assets than a group of employees who are prosperous, healthy, intelligent, and happy in their surroundings. Why, then, is it that so many companies can see no "good business reason" why they should *waste time getting involved in things that don't have anything to do with producing more widgets?*

That is not the attitude, for example, of the Revere Copper & Brass Company of Rome, N. Y., which has prepared, written, and distributed 1,200,000 copies of an extraordinary booklet called "You and Your Neighborhood." This brochure, which contains a well-illustrated and warmly sensible description of what makes a good neighborhood, has not only made a lot of friends for Revere in



Typical page from Revere Copper & Brass Brochure, "You and Your Neighborhood." With more than a million copies distributed in Revere's hometown and all over the country, it's a good example of how a company can consolidate its community standing

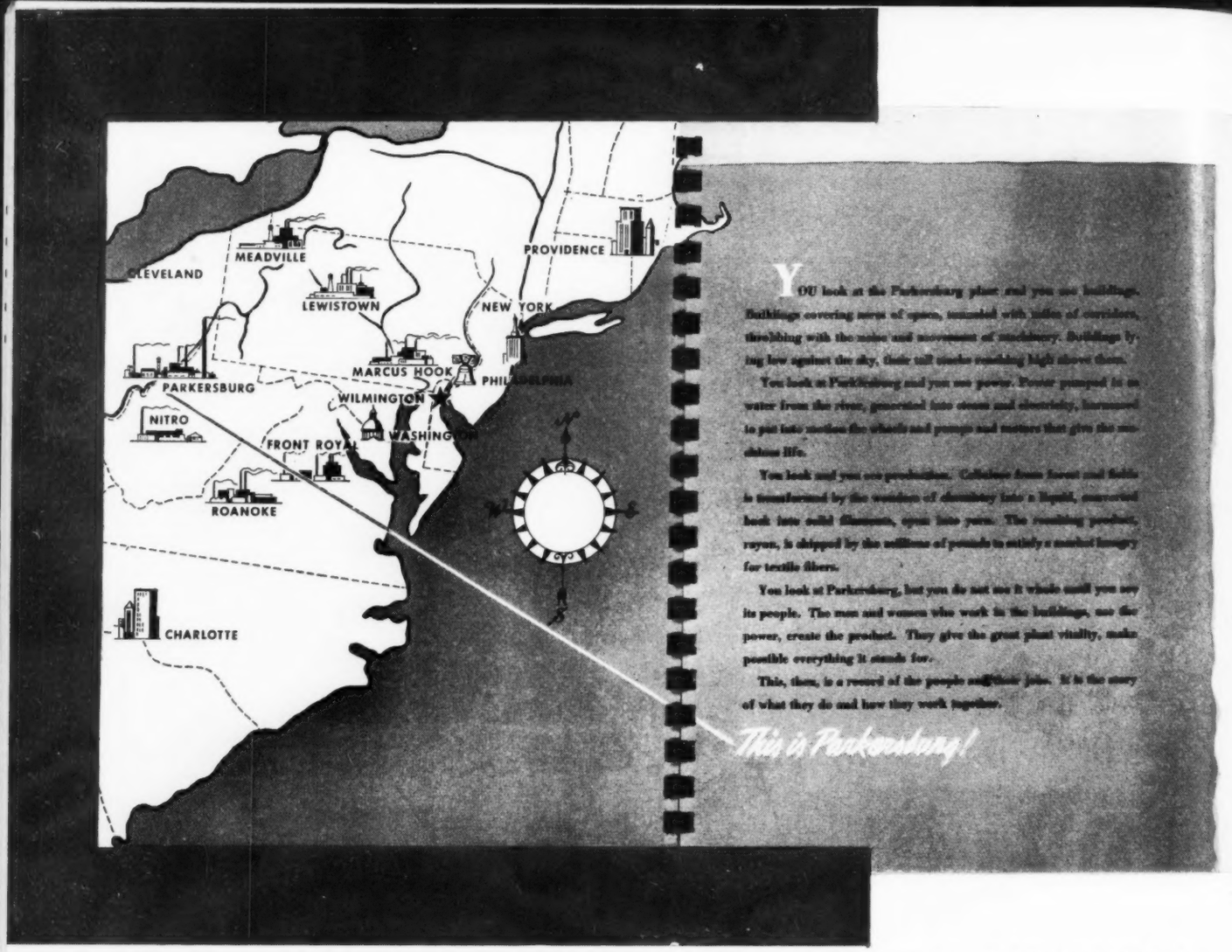
its own hometown, but has also proved good public relations in other hometowns all over the nation.

Many company managements take the attitude that on community matters such as zoning laws, street improvements, school taxes, the best policy is to maintain a dignified silence, and to do whatever talking is necessary in the private offices of town officials. But not so with a company that operates mills in half a dozen small New England and Southern towns. This company maintains a continuing public interest in anything that affects the well-being of its employees and their neighbors, from a new firetruck to a peddler's franchise to sell ice cream on the street. It makes its offices available for discussion forums, and runs "institutional" ads backing up the editor, the Rotary Club, the PTA, or whoever else is currently striking a blow for a worthy community cause.

KIDS IS KIDS

Now let's talk about kids, and why business management ought to learn more about them. Kids are the biggest common denominator of community life. In the final analysis, residential problems, neighborhood store locations, schools, recreation, health, and even a town's cat and dog population densities, all revolve around the community's kids. And local industry will do well to get in the orbit. If for no other reason, today's kids are tomorrow's workers, and if they don't like the XYZ Company today because it has big "keep out" signs on its fences, they won't be keen on working overtime for it tomorrow.

But that's not how it is between the kids in Dayton and the Inland Manufacturing Company. Fifty girls and 50 boys belong to the company's Children's Chorus and when they get all dolled up in their special singing regalia there's harmony all over the place. And they never appear publicly until "the best staging possible" (a tiered platform) has been provided for them. They've



Pulp goes in one end of the American Viscose plant. Rayon fibers come out at the other. Parkersburg people were naturally curious. So the company took the mystery out of it all and told the home-folks how and why everybody at the plant does his or her job

been on coast-to-coast networks and sung with the Dayton Philharmonic.

And when they aren't vocalizing the boys can play in a six-team baseball league with some of the company's braver fathers acting as umpires. The girls also have a Campfire group, with meeting facilities in the plant and with six Inland girl employees plus a director to help with their program. And all this in spite of the fact that Inland is a branch of one of the biggest corporations in the world.

One hot summer day a pint-sized construction crew of Peoria kids were picking and shoveling at a vacant lot, spurred on by visions of a baseball diamond. Progress was so slow that they were easily distracted to watch a big bulldozer coming down the street. Just imagine the juvenile joy when the big "Cat" huffed up to their vacant lot, asked for instructions, and proceeded to root out a nice smooth ballfield in less time than you could play a good game of mumblety-peg. The bulldozer had received its crawling papers from the office of Caterpillar Tractor Company's *community relations division.*

The Ecusta Paper Company feels much the same way about its community of Pisgah Forest, 30 miles back in the hinterland from Ashville, N. C. Because the community itself is limited in "cultural" facilities, the company has gone so far afield from its strictly "production factors" as to:

1. Buy a former boys' camp and convert it into a recreation center for both grown-ups and kids, with picnic grounds, boating and swimming areas, and playground equipment.

2. Offer free music instruction to interested children, with individual training for those with real talent.

3. Show community movies once a week in the big plant recreation room, with frequent square dances and bingo parties for variety.

4. Lend liberal support to the local hospital and a small college.

Just one of the "practical intangibles" that Ecusta gets in return for this interest in its people is the lowest accident rate in North Carolina and second lowest in the entire South.

During the recent wave of serious "reconversion" strikes the "human interest" feature writers of the daily press seemed to have rediscovered the obvious fact that a worker's wife and kids have a big stake in his job. His family has this continuing interest in a breadwinner's job all the time, and a little bit of imagination can turn such interest to good account.

As businessmen talk in abstractions about the "lengthening separation between management and workers" and lament the fact that the employee doesn't seem to have any interest in his job beyond his pay check, then the time is getting riper to begin doing just such things as having the worker and his wife, kids, and neighbors in to see what really makes the wheels go round down at the plant. And there are lots of other ways to knock the

sharp impersonal edges off a corporation's personality.

For instance, there is an Indiana plant whose accounting department is a very proper and orderly place of business by day, but at night it sounds like the girls' locker room in a high school—which is not so unnatural, because the students from a nearby commercial high school come over to practice on the company's typewriters, adding machines, and comptometers. (And during the war the company never had trouble finding extra office help.)

Other companies have found that letting trade and high school students get in a few extra "trial runs" on "real sure 'nuff" lathes, drill presses, and other machines has paid off both in new *future* workers and a better attitude among their parents who are *current* workers or neighbors.

Probably the biggest single piece of evidence that this sort of "plus" contribution by enterprise yields dividends is the experience of hundreds of companies around the nation which have sponsored Junior Achievement Corporations, and through them have helped neighborhood teen-agers go through every step of business operation, from selling stock to producing goods for competitive sale. Company executives and factory workers all can and do serve as advisors to Junior Achievement Companies, with mutual benefit.

WHAT'S COOKIN'?

That's what the people in Parkersburg, W. Va., wanted to know about the American Viscose Corporation's plant where wood pulp went in one end and rayon fibers for all kinds of fabulous products came out the other. So the company told them—in a carefully illustrated booklet that showed what and how and why everybody, from the timeclock setter to the last valve turner, performed his or her job. Publication of the booklet made it a lot easier for every employee to show the family and neighbors what a really big operation his or her work was a part of.

Such local pride is the acid test of a company's plant-city public relations job. A proud employee is one of the best salesmen a company can have; and the best possible base for good personnel operations is a reputation that the XYZ Company is a "good place to work."

For example, Oneida Ltd., at Oneida, N. Y., has found over a long period of time, and especially during the war, that its folksy ads showing why Oneida is "a friendly place to work" were highly reassuring to new workers who had never worked in a big factory before. Moreover, the regular employees of Oneida consider it their own prerogative to show by their actions that the company *is* "a friendly place to work."

LAYING IT ON THE LINE

As the war began to draw to a close, managements in every kind of business were confronted with new evidence that a worker's concern over his job tomorrow is a big factor in his performance today.

Those companies that "laid it on the line" as to what they planned to do in peacetime found that it not only reassured their own workers but also gave their plant communities a helpful fillip.

In Memphis, when the local Committee for Economic Development prevailed on a score of industrial companies to declare themselves about the future by publishing summaries of their plans in the newspapers, the interest ran so high that the whole series was reproduced in a booklet called "There Won't Be Any Letdown in Memphis After the War."

The report produced all kinds of good results. The local War Manpower Commission head reported an immediate drop in labor turnover in strictly war jobs because workers had greater confidence in their chances of getting another peacetime job when they needed it. But more spectacular were the "community results." Main Street merchants, who had been holding back because they were worried about payroll declines, began making bigger and better plans for store modernization and new lines of goods.

The same kind of "chain reactions" took place in cities like Grand Rapids, Minneapolis, Dallas, San Diego, and many smaller places as CED industrial surveys showed what local companies were planning. In Eau Claire, Wis., the city fathers got busy planning new streets, new schools, parks, and a new zoning plan when local industrial leaders declared they could provide employment for 50,000 people by 1950. (The town's slogan is now "50 by 50.")

In Wichita the Beech Aircraft Company, which makes almost a fetish of keeping its employees and neighbors informed on what the company is doing today and planning tomorrow, issued a booklet called "Beechcraft's Projects for 1946." Pointing out that it would have taken 300 years for Beech workers to have accomplished their war production record at the company's 1940 rate, the report proceeds to describe why the management expects a "howling wonder" of results in peacetime.

In a moderate-sized midwest agricultural community there is a large modern factory which is the biggest single employer for many miles around. The president has everything it takes to be an "economic royalist," including two Cadillacs. He has no chauffeur but he does have a reputation as the "regularest guy in town." The two facts are related because the reason he has no chauffeur is, in his words:

"If I had a chauffeur up front and me in the back, I might pass some of my friends on the street. And what's the use havin' a great big car if you can't give your friends a ride?"

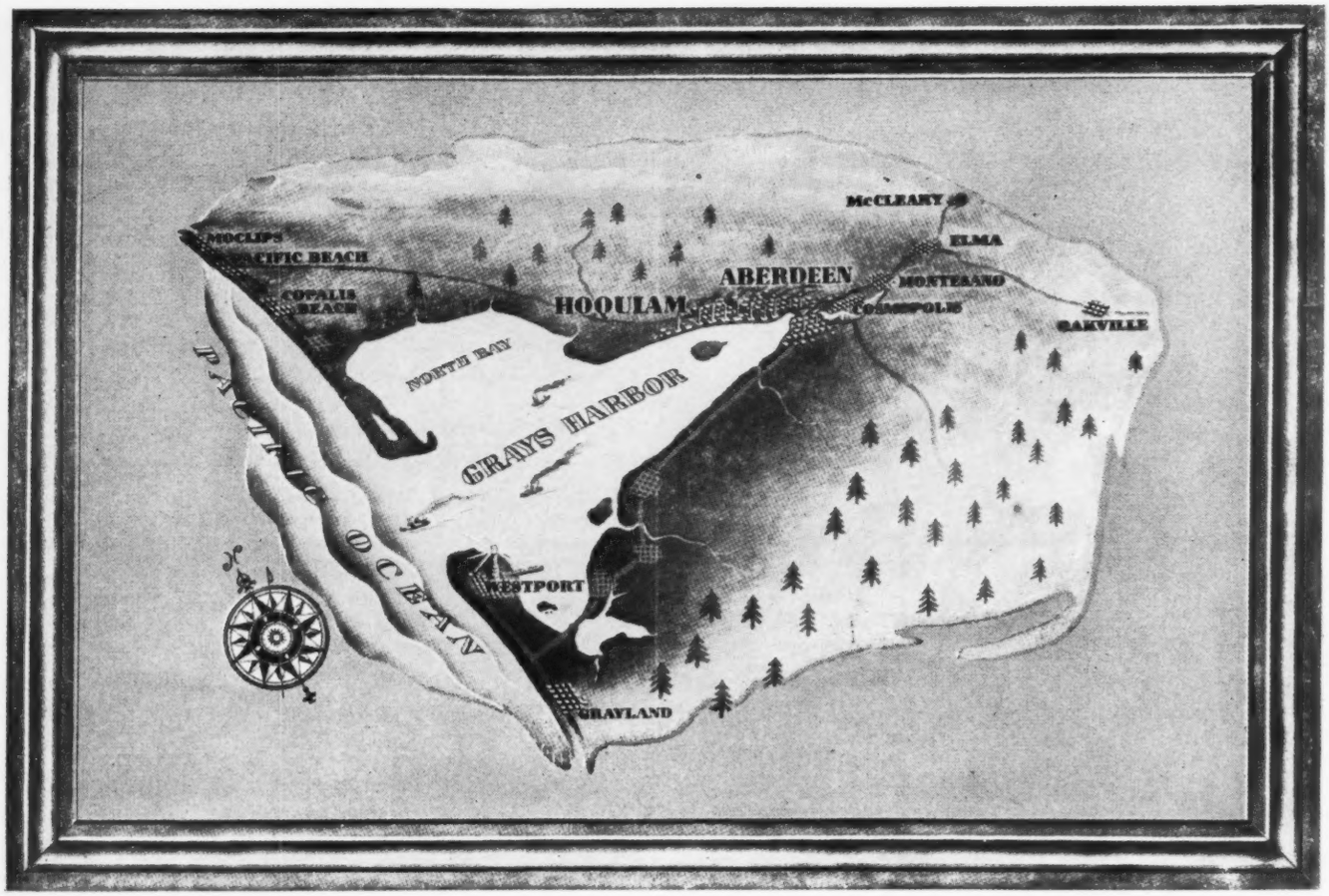
And that's why it is that visiting businessmen being driven to the station may have to detour by way of a swimming pool, the post office, or the dentist's, depending on where some of the boss's friends met along the road happen to be going.

He and his company are the two biggest taxpayers in the community, and when he heard that the town had a whopping cash surplus he went down to town hall and raised cain—not because taxes were too high, but because the town fathers had the money in the bank instead of spending it on whatever the community wanted most.

This businessman's methods are a refreshing exception to the tendency of top executives to be heard of but seldom seen in their community, except in strictly business circles. His methods also demonstrate the axiomatic truth that it takes humans to do human relations. To which might be added that it takes an unusual amount of the human touch among the head men to give a company a personality; and if personality seems to be missing in the front office, the quality can't be made up from the publicity office alone.

THE HUMAN TOUCH

Probably one of the most classic examples of what the human touch can do in this regard is the Land O'Lakes Creamery Corporation in Minneapolis. Here is a company with workers, owners, customers, and neighbors in not just one community but in hundreds of



This is Grays Harbor

WHEN CAPTAIN ROBERT GRAY discovered Grays Harbor in 1792, it was not merely the result of an adventurous expedition. It came, rather, because a group of far-sighted men financed the voyage, hoping to explore the possibilities of "traffic with the natives of the Northwest." It was in reality a business venture.

Gray himself knew this. On his own chart he gave this port its first recorded name—Bullfinch Harbor. In doing so he sought to honor John Bullfinch of Boston, one of the owners of the ship *Columbia*—one of the men who made his voyage possible.

Thus, the spirit of enterprise entered Grays Harbor history in the very beginning. Grays Harbor was discovered, founded and made to progress because men were willing to risk their time and money, willing to invest in the future. That's the way things have always been in America. America has said to all men: "Create new enterprises. Plan ahead. Build. If your ventures fail, that has been your risk. If they succeed, you—and other men—shall enjoy the fruits of your honest effort."

Today, men need this assurance more than ever before. The future is a challenge, posing tremendous problems. There are new ventures to launch, industries to build, communities to develop, work to be done—and jobs to be created.

Here on Grays Harbor, for example, there are abundant resources only partially realized. These must be developed. Every citizen—every man, woman and child—has a real stake in this development. For every citizen already has some form of investment in the common welfare. Every man who works for wages . . . every merchant, professional man, teacher . . . every municipal, county, state or civil service employee . . . every employer, whether his payroll lists one or a thousand names. Yes—the future is a challenge. And, as in the past, it is beset with dangers, too. In Gray's time, vast portions of the earth were uncharted and mysterious, a "new world." Today, America must explore another new world—a world which men themselves must create. Safe passage depends upon skill, knowledge, courage and enterprise. It depends, too upon "weather"—the man-made weather of political and economic law. Just as Gray and his tiny *Columbia* could proceed only on promise of fair winds and tides, so today's voyagers require weather which is favorable to enterprise.

It *must* be favorable. For then a man—any man—will be free to confidently start a new business of his own, or expand his present business. He will be eager to build his own future, and in doing so he will create work for other men. Everyone will benefit.

This, then, is Grays Harbor—a vital segment of America and the American way of life—a region of potential prosperity greater than any the past has known. Under favorable conditions it will certainly grow and develop. The time for decision is near. Every citizen will have a part in making this decision—and, in turn, every citizen will be vitally affected.

If it is made with sincerity and courage, and with full knowledge of America's heritage, then Grays Harbor will go forward to a future of greatness—a future full of promise for all.

Grays Harbor—and all America—was founded and built on the fundamental principle that any man or woman should have the right to work—should have the right to start a business of his own and to enjoy the fruits of his labor. As a result, no other nation in the whole world can approach the industrial might of America. In no other nation has the standard of living risen so high for the individual willing to work for it. This results from the American Way of Life, and is the pathway to an even greater America. Why change it?

★

The sponsors of this series of advertisements devoted to community betterment are citizens of this community. They own homes here. Their children go to school here. They have a deep sense of responsibility to the individual citizens and to changes which will affect the community. They are interested in developing a healthy community following the American Way of Life, and thus keeping America and Grays Harbor strong for the generations to come.

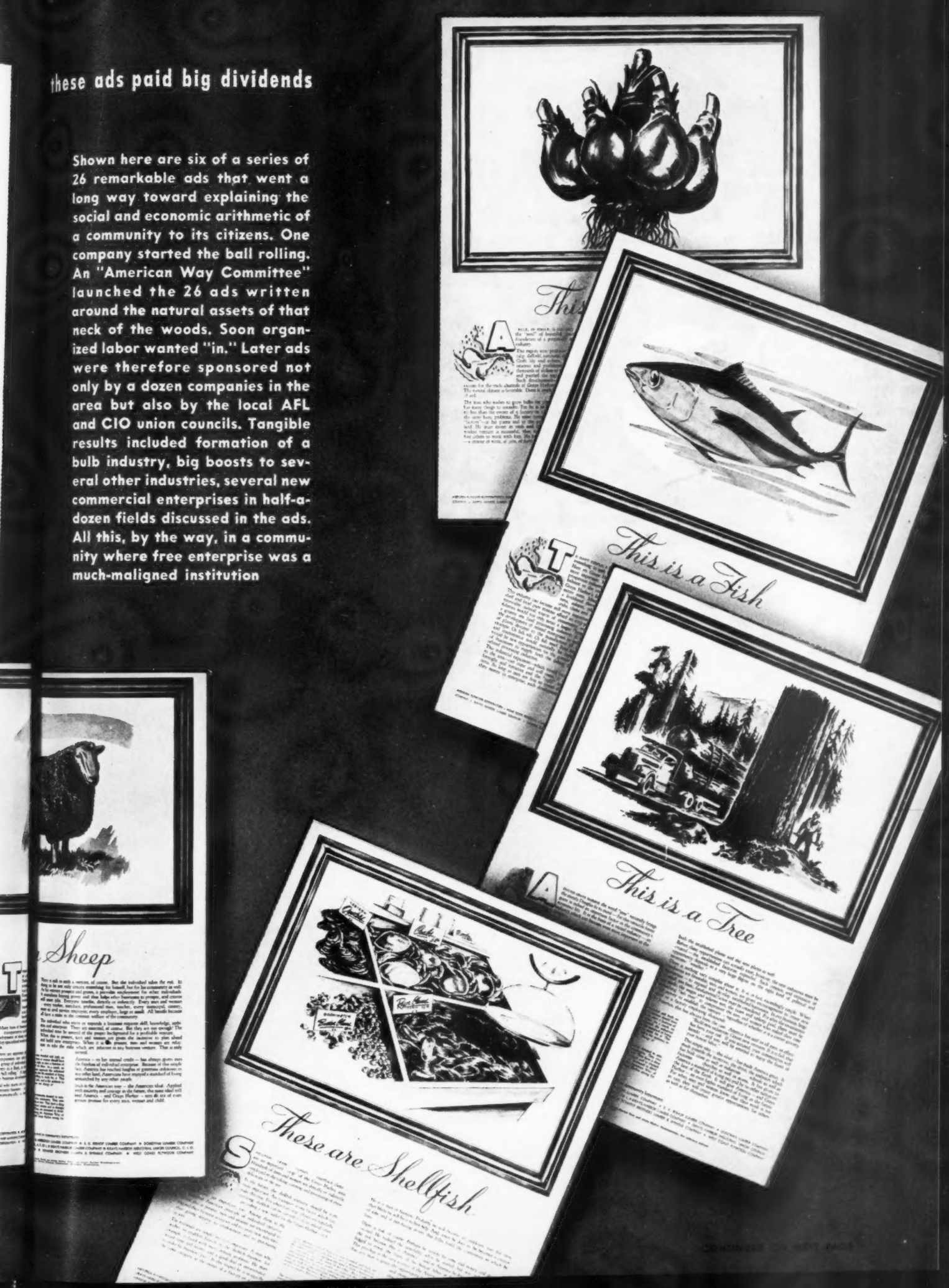
★

One of a series of advertisements devoted to community betterment.

ABERDEEN PLYWOOD CORPORATION • ACME DOOR COMPANY • AMERICAN MILL COMPANY • ANDERSON & MIDDLETON LUMBER COMPANY • E. K. BISHOP LUMBER COMPANY • DONOVAN LUMBER COMPANY • GRAYS HARBOR CHAIR AND MANUFACTURING COMPANY • GRAYS HARBOR LUMBER COMPANY • HARBOR PLYWOOD CORPORATION • POSEY MANUFACTURING COMPANY • RAYONIER INCORPORATED • SCHAFER BROTHERS LUMBER & SHINGLE COMPANY • WEST COAST PLYWOOD COMPANY

these ads paid big dividends

Shown here are six of a series of 26 remarkable ads that went a long way toward explaining the social and economic arithmetic of a community to its citizens. One company started the ball rolling. An "American Way Committee" launched the 26 ads written around the natural assets of that neck of the woods. Soon organized labor wanted "in." Later ads were therefore sponsored not only by a dozen companies in the area but also by the local AFL and CIO union councils. Tangible results included formation of a bulb industry, big boosts to several other industries, several new commercial enterprises in half-a-dozen fields discussed in the ads. All this, by the way, in a community where free enterprise was a much-maligned institution



towns scattered all over Minnesota and four surrounding states, in which are located its small creameries and processing plants. Together they make up one vast company handling more than a billion pounds of milk a year.

The human touch is maintained among all these people with a stake in Land O'Lakes by means of a radio program broadcast six days a week at 7:15 a.m. The program covers a ditty-bag of matters great and small dealing with the company, the dairy industry in general, and related current events. On Saturday mornings John Brandt, farmer and president of Land O'Lakes, has an *ad lib* chit-chat with his "constituents" on the air. Success of the program is indicated in part by the fact that even among metropolitan listeners in the Twin Cities, this rooster-hour program has the second largest listening audience of a half-dozen programs available at that time of morning.

Another company that uses radio to advantage in its community relations is the Timken Roller Bearing Company. Timken really does this phase of company-worker-community relations by radio up brown, with four different local programs over WHBC, Canton, Ohio. The company sponsors a morning newscast and an evening sportscast as "service" programs on which the commercial time is used to discuss current Timken employee activities and company-community topics. On Sundays the company sponsors a half-hour of "Music America Loves," including 5-minute talks by members of the Timken management on "the state of the company." A fourth weekly program features a local commentator who discusses current business and public problems under the heading of "Economic America." Each week some 25,000 reprints of these talks plus those voiced on the Sunday musical program are mailed to employees and others in the community and elsewhere.

PAYOFF ON THE PUDDING

Reconversion with its attendant labor-management strife afforded new evidence of the fact that long-term good will between a company and its worker-community pays off; also, that in the absence of such enduring good will a few last-minute strike ads about the amenities of free enterprise don't amount to much. As a result many companies are coming around to the conclusion that maybe plant-city good will advertising ought to be made a *regular* rather than a *stop-gap* part of company policy.

If there are any doubters as to the soundness of such a conclusion, provided such advertising is itself part of a sound community relations program, the doubters might do well to study the recent life and times of Gray's Harbor, Wash. Folks in this far northwest neck of the woods have really learned a thing or two about the importance of industry-community relations.

They had plenty to learn, too, because even before the war this timbered area was a hotbed of worker unrest and social agitation spurred on by numerous "wobblies" and miscellaneous brands of professional and amateur agitators.

Against this background of bad labor-management relations a few business leaders could recognize that their whole community area, in spite of its rich and varied resources, was being seriously retarded. Free private enterprise was a much-maligned institution.

Finally, in 1944, E. W. Daniels, president of the Harbor Plywood Corporation, decided that if the "American way" was worth fighting a war over, it was worth doing something about at home. As a starter the company ran a full page local ad which sought to explain in the simplest, most realistic terms why "A Factory Is Like a Tree."

Apparently the simple analogy and the earthy community economics in the ad rang bells because the response nearly snowed Daniels under. It was more than enough to convince him that he was on the right track. After considerable discussion of the ad and its results with other businessmen in the Gray's Harbor area, an "American Way Committee" was formed to see what further progress could be made in explaining the social and economic arithmetic of the area to its citizens.

Out of this beginning grew 26 of the most extraordinary "institutional ads" ever published. Under such headings as "This is a cow," "This is a fish," "This is a turkey," the series went through the entire economic fabric of the area, explaining both what had been done and what *could be done* with the natural assets which Gray's Harbor people had to work with.

By the time six of the ads had run, organized labor in the area decided they wanted to get in the act, too, so the Central Labor Council AFL became a sponsor along with twelve local companies. Copies of the ads were posted in labor halls, schools, and on every other kind of bulletin board available. Local stores put in big window displays concurrent with the ads. Reprints were requested by the hundreds and soon each forthcoming ad became a front-page news item.

What about results? Well, the region now has a full-fledged bulb-raising industry, whereas before the ad "This is a Bulb" appeared this had been only one of many agricultural possibilities. The shellfish, poultry, and berry industries have all received a huge boost; the tourist business has become a *business* rather than an also-ran avocation; and new commercial enterprises have been started in at least six other fields of business discussed in the ads. Their owners are people who were only awaiting something to give them greater confidence in the area's future. Unemployment is virtually nil, although Gray's Harbor is in one of the regions where reconversion was supposed to produce "critical" conditions.

PRICE OF GOOD WILL

Many companies carry their "good will" on the books at $1, yet realizing that without the public's good will their other assets, carried on the books in millions of dollars, would be useless. This irony of bookkeeping dramatizes the fact that good will and the good public relations necessary to produce it are both intangible assets. This is the great handicap of public relations as a factor in management's day-to-day operations. A few moments' calculations will tell management how much it will be worth to production and profits to add a new lathe or an automatic packaging machine. But how much is it worth to XYZ Company to give $1000 to the Community Chest or to make an idle warehouse available to the Woodchuck Patrol of Boy Scout Troop No. 84 for an indoor jamboree?

The engineer hasn't yet been born or the slide rule invented that will ever be able to convert this kind of "humanics" into dollar-and-cents business statistics. But many a hard-headed company manager has already come to the conclusion that such intangibles of good fellowship in the plant and good citizenship in the community are very real "factors of production," and as such should receive the same attention from top management as any other factor of production.

PUTTING THE SHIPPING ROOM ON A PRODUCTION-LINE BASIS

GEORGE A. SMITH • MANAGER, TRAFFIC DEPARTMENT, THE BROWN INSTRUMENT COMPANY, PHILADELPHIA

In concentrating a cost-cutting scrutiny on its direct production operations, industry may be overlooking a good bet in not also considering its indirect operations. By applying "production-line" methods to its shipping department, this company has obtained money-and-time-saving benefits

By ignoring the traditional cry of "we've always done it that way" in its search for cost-cutting improvements, The Brown Instrument Company has effected substantial economies in its shipping department. Other results of this approach have been an improvement in customer service and greater over-all departmental efficiency.

Until recently, all shipments of orders for its indicating, recording, and controlling instruments were delayed at Brown until every item in an order was ready. That was the accepted way of making sure each order was shipped complete. Under the new plan, individual items are not accumulated until the last item is completed, but are shipped as soon as they are ready.

For example, if the sales order is for a flow meter installation, one of the items will be an orifice plate, which takes only 10 to 14 days to manufacture, compared with many weeks for the intricate recording instruments. Under the new plan, the customer receives the orifice plate within 2 weeks, and can install it in the line and complete the piping while waiting for the slower items on the order. Likewise, shipments of thermocouples, lead wires, and similar accessories are able to precede the more complex instruments, with corresponding benefit to the customer.

Here are the tangible results of this reversal of policy:

1. Floor space requirements were reduced from 4500 to 3500 square feet despite a 20 percent increase in load.

2. Labor costs were reduced by the elimination of 5½ workers.

3. Shipments are now being made within 24 to 48 hours after receipt of individual items from the shop, instead of 7 or more days, as formerly, after all components were ready. This enables customer to proceed with primary construction preparatory to installation of instruments which are received last.

In the old system, actually two departments were necessary to carry out the plan, one for accumulating the finished stock in bins until all items in an order were ready, and the other for shipping the complete order. As each item, whether custom-made from the shop or a stock item from the stores department, came into the finished stock area, it was pre-packed and placed in the nearest bin of the right size.

In pre-packing, consolidation of items for the same order was attempted as much as possible, but the unavoidable dribble from the shop over a period of many weeks allowed but meager savings from this effort. Although, for example, only 10 to 14 days were required to manufacture a thermocouple or an orifice plate, many weeks were needed to make and assemble the instruments on the same order. Often a single sales order involved an accumulation of as many as 120 items. Pre-packing of ready items was necessary, however, not only to minimize damage but also to assure identification for final shipment.

The practice of accumulating items for orders in the finished stock bins involved not only considerable handling, but resulted in much congestion, with attendant confusion and use of extra bin space. Despite pre-packing, there was still some breakage, with resultant delay in final shipment. Moreover, pre-packed items of one order might be scattered in many bin locations.

When placed in "finished stock" bins, each item had to be reported on a special copy of the order as to bin and aisle location. Occasionally, items were lost through errors in recording. Then, when all items of one order were ready, they were removed from the bins, placed on one or more platform skids, and moved by hand lift-trucks to the shipping area for final checking against a shipping order, for final packing, and shipment.

This routine involved an average of five complete handlings per order. At the same time, the customer was penalized by having to wait until the entire order was completed, for some items that could have been shipped and readily installed in the meantime.

With the introduction of the new shipping system, the work of temporary accumulation of items in storage bins, and their later removal, was eliminated. The function of the finished stock department was absorbed into the shipping department.

SPECIAL TRUCKS

A special 5-wheeled floor truck, capable of holding five or more tiers of rectangular open-front steel trays on a steel rack framework, was adopted. Occupying only about 5 square feet of floor space, each truck can hold trays equivalent to at least five times that area. The trays can be hooked on the truck frame at varying intervals to suit the load dimensions up to a height of 5 feet, and for a total capacity of 2000 pounds.

Based on the load flexibility and mobility provided by these special floor trucks, a new layout (see facing page) was made of the shipping department so as to continue the flow of the materials, as they were received from the shop, right out of the shipping door. Incidental to this change, sizes of shipping cartons were standardized, and cartons were stored in five overhead slings, 10x20 feet in size, instead of on the floor as formerly. The floor was further cleared by removal of all but

one row of storage bins. This remaining row was retained along one wall to hold stock items of instruments, accessories, charts, and wire for which there was the greatest demand.

Because of their large volume, many other similar but lesser used stock items were kept in the stores department some distance away. On the whole, about three-fifths of all items manufactured by this company are custom-made, and the balance are manufactured for stock. Many orders, therefore, contain both elements, so that provision had to be made for shipments of both types. It was conveniently arranged to ship purely "stock-parts" orders directly from the stores department, and all "mixed" orders from the shipping department. No confusion exists as to which department is to ship, because on all factory and shipping orders custom-made items are starred, thereby automatically indicating the routing of the finished item from the shop directly to the shipping department.

HOW TIME IS SAVED

A study of the new shipping operations shows how the benefits in time and labor savings have been gained. As each finished item comes in from the shop in 4-wheeled box trucks to the pre-packing bench, it bears a tag identification with sales order number and item number. The part is pre-packed, data from tag are marked on the outside of package or carton, and package is placed on a tray of the special truck.

When all its trays are filled, the truck is pushed into the line-up before dispatch benches. The dispatcher obtains the shipping order from the shipping office (by order number), and adds to the tray whatever stock items of accessories and charts are called for on the order. These items he obtains either immediately from stock bins along wall, or, if not available there, he telephones to the stores department for them. Missing stock items properly identified are sent promptly by scheduled deliveries from the stores department in a similar 5-wheeled floor truck.

In the meantime, trays containing orders that are waiting for stock items are placed on a floor truck which is shunted aside and held for arrival of stock items. In these trays are placed red, yellow, or blue tags, attached to each shiping order, which quickly indicate what is needed to anyone checking the reason for delay. A red tag means stock parts are missing, yellow means charts, and blue means wire.

Special floor trucks with tiered trays filled in previous shipping operations with pre-packed custom-made and stock items, are lined up at final-packing benches (at left). At right, a dispatcher is checking orders and adding stock items from bins against wall

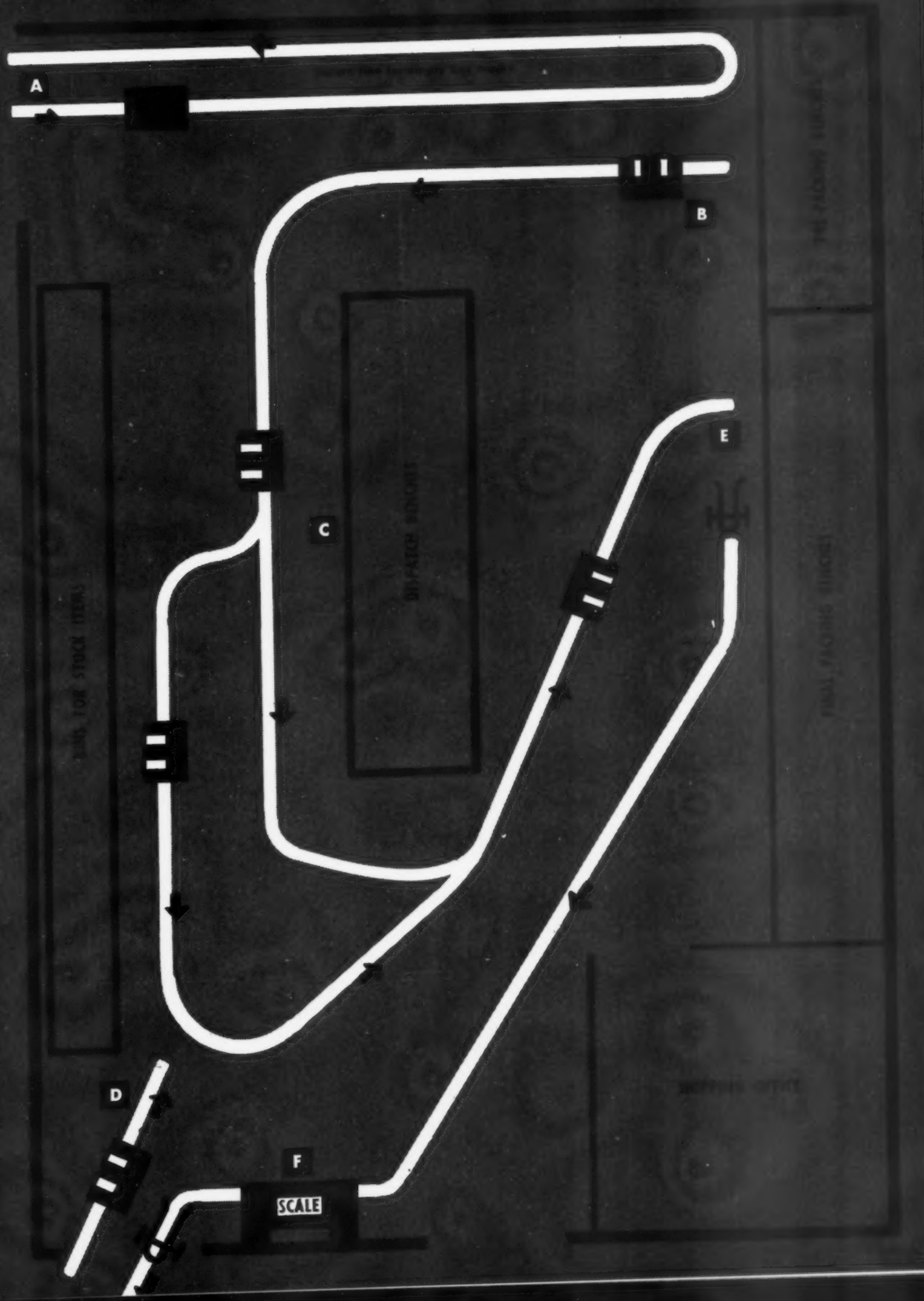
After all needed stock items have been combined by the dispatcher with the special items already on trays of a floor truck, the truck is moved over to the final packing bench. Here each order is packed in a protective shipping carton, which is hand-trucked to the scale, and placed on the shipping platform ready for shipment. Usually no more than one day elapses from the receipt of an item in the shipping department until it is shipped.

If only one of several custom-made items on an order is received from the shop for shipment, it is never held, but follows the same routine. When a partial shipment of this kind takes place, the dispatcher makes out a partial-shipment form indicating what is being shipped. All shipping papers go with the order on the floor truck from dis patcher- to final packer and then to the shipping office. If a shipment is completed, these papers are then sent to the billing department. For partial shipments, however, all papers are held in the shipping office, but a copy of the partial-shipment form is sent to the billing department for the usual prompt invoicing. On lump-sum sales orders, the billing is delayed until final shipment.

Specifically, the new method has eliminated the need for issuing, marking, and filing the finished-stock copy of all sales orders. Shipping costs are no higher on a partial-shipment basis. Work can be checked and moved along from station to station without looking for hand lift-trucks. Material damage has been reduced to a minimum because of the ability to handle fragile items on individual trays rather than piling everything on skids. In other words, shipping on a "production-line" basis is far superior to the old method.

new shipping layout

1. Cartons of finished parts from shop are brought in and weighed on scale at F.
2. Parts are checked, marked, and transferred to trays on overhead conveyor.
3. Shipping clerks check with shipping order and take trays down to proper section of customers stores department for shipping there.
4. Shipping items from stores department are brought to waiting line at this point.
5. Customers and stock trays are packed in carton for each order and cartons are moved away on hand trucks.
6. Cartons are weighed, and taken to shipping platform.



THE NEW YORK TIMES, MONDAY, MAY 20, 1946.

NOW A NEW WAY TO GET ACTION
for "Today's Forgotten Man"
IN STRIKES, SHORTAGES AND INFLATION

PRINCIPLES FOR ACTION

WHY I ORGANIZED THE TOOL OWNERS UNION

ALLEN W. RUCKER • PRESIDENT, TOOL OWNERS UNION; PRESIDENT THE EDDY-RUCKER-NICKELS COMPANY

Before the Tool Owners Union was started, I thought that I and a comparatively few other people in business were almost alone in our concern that the United States would soon slip backwards because it is not maintaining its stock of tools—its farm machinery, buildings, machine tools, transportation equipment—everything used in producing wealth.

Tools converted the United States from plains and forests scantily supporting half a million Indians into an arsenal of good living—the world's best—for 140 million Americans. So important are tools that in 1940 I predicted the Germans would lose the war because they were exhausting their stock of tools. Today this country is similarly exhausting and failing to replenish its stock of tools. In fact, sometime before 1940 the curve measuring the net growth of our tool stocks fell behind that measuring our population growth and standard of living for the first time. During the war, of course, our tools for manufacturing the things we need as civilians were still more neglected.

Either we must bring our tool stock up to meet the needs of an increasing population and a rising standard of living or our standard of living and our population inevitably fall to the level of production our depleted tools can maintain. And, if our tool stock continues to fall, the United States will lose its place as a leader of nations. It has happened to one nation after another through all of recorded history. We are no stronger than our tools.

This is serious. But I, living and working in the somewhat rarefied air of management levels, supposed that the people of the United States didn't know what was happening and weren't too concerned about the well-being of our tools and the welfare of the people who own and supply them.

I outlined the problem, though, one evening in a brief talk over a local radio station in Boston. My office and the station were flooded the next day, to my surprise, with letters, calls, and telegrams asking that someone do something—and most letters suggested that I was the someone.

Those calls and letters generated the idea for a tool owners' union—an organization to express the beliefs of the 50 million Americans who are owners of tools in that they have interests in small businesses, own stock or bonds in larger companies, or have life insurance, savings bank accounts, or other interests that make them indirectly owners of the country's tools for production.

Once the idea had jelled, we formed an organization in Lexington of two or three men who thought the same way I did. We ran an advertisement in the Lexington *Minute Man*, which has a total circulation of 2800. The response swamped us.

I sat up nights reading the hundreds of letters pouring in, trying to analyze the feeling of these people—the kind of Americans a lot of us have come to think no longer exist.

From these grass-rooters' letters, I have three sharp impressions:

1. The people are all for America. They are for America, first and last, with no wavering feelings.

2. Running through all the letters is

a current of fear. People are also angry and strongly disgusted with strikes, with the political situation, with the unrest and the selfishness which are now so common.

3. They are worried about subversive elements. That people fear Communists and radicals above all else is the strongest single impression I have from these letters.

Today TOU is growing by leaps and bounds. We are continuing to run full-page advertisements, but can't do it as often as we should like because our staff of ten girls can't open mail, tabulate returns, answer correspondence, and keep up with the replies. Company officials ask for blocks of applications to distribute through their firms. Farmers circulate their neighborhoods. Civic club members join in groups. New members sign up by the hundreds through every mail.

I have had so many hundreds of requests to speak all over the country that I can't even keep up with the correspondence on the requests. Now, however, a corps of volunteer speakers —all veterans—are representing TOU in every section. Our first local was organized in Lexington, the second in Tucson, Ariz.

INDIVIDUAL MEMBERS ONLY

There are famous names among TOU members now, but I'm far more concerned with the non-famous—and their enthusiasm is compelling. We have limited TOU memberships to individuals, ruling out corporations or other organizations, to keep the movement truly American, a free expression of individual tool owners' beliefs.

There is only one thing that we are not telling about TOU now, and that is because we don't want figures circulated that are out of date before they can be printed. TOU will keep the size of its membership and financial condition confidential until we have 1,000,000 members or 1000 locals. When we reach that point—which shouldn't be too far away—we shall have the strength to be politically significant.

Then, too, TOU can go all-out on its program of political and economic education. We shall undertake the research and publication, industry by industry, of how thrift, risk, and tools have expanded employment, production, and earnings. We shall encourage corporate, insurance company, and bank directors to mail to stockholders, insurance policy owners, and depositors the facts about TOU's effort to restore the American way of incentives. We hope to discourage incompetent and inexperienced men from running for public office, and to encourage men of conscience, competence, and courage to run by publishing the qualifications of all applicants for positions as "public servants."

As TOU sees it, the foundation of our national strength and our material well-being, as well as the dignity of mankind, is our tools production. Those tools must be renewed and replaced. They must be increased faster than the growth of our population and equally as fast as those of any foreign nation. To do that in freedom, we must strengthen, not weaken, the basic incentives by which this nation's progress has been powered:

1. *Free Bargaining*—that every man may enjoy the human right of directing his own efforts as he sees fit, subject only to the restriction that he shall not trespass on the equal right of others to do likewise.

2. *Enforcement of Law and Order*—that every man shall be protected in his person, his character, and his property, against illegal violence and intimidation, defamation, and destruction.

3. *Free Markets*—that every man may enjoy the full fruits of his exertions in the value put upon them by his fellows, safeguarded against *excessive* taxation, monetary manipulation, or confiscation.

4. *Dignity of Property*—that every man may have the right and the opportunity to save and to invest his savings in productive tools.

Given these incentives, the American system of brains, sweat, and teamwork will carry us to new heights.

YOU ARE A TOOL OWNER . . .

IF . . . you have a savings bank account. Over 45 million people have such accounts and over 70 percent of bank deposits are invested and loaned by banks for "tools of production."

IF . . . you have an ordinary life insurance policy. Over 40 million people have such insurance and over 80 percent of insurance assets are invested in productive property—i.e., tools.

IF . . . you are among the 8 million people who own stocks and bonds. For it is your money in these investments that goes into tools used by corporations—and you can easily lose that money unless you bargain for fair payments for the use of your tools.

IF . . . you are among the 16 million "small business," professional men, and farmers. Your savings are tied up in furniture, fixtures, trucks, equipment, barns, and tractors you use to make a living.

IF . . . you are a church pastor or officer of a college or school or even a charitable organization. For endowment and trust funds are only as good as the income earned by payments for the use of tools such funds have helped to buy. It is YOUR church, YOUR school, YOUR charity that suffers from strikes and inflation.

IF . . . you are among the 13 million women who receive income from life insurance and other property—and it is YOUR living that depends on payments for the use of whatever tools that money is invested in.

REMEMBER . . . there is someone who is a more powerful protector of productive property than any one of us—and that is every one of us. Hence a Tool Owners Union to speak, work, and act together gives us the most powerful force known to safeguard the nation's strength and the welfare of all of us.

SELECTING THE RIGHT FLOOR FOR LOW UPKEEP COST

GEORGE MONEY • MAINTENANCE ENGINEER, NATIONAL SCREW & MANUFACTURING COMPANY, CLEVELAND

Many years' experience with various types of floor surfaces under diverse operating conditions has convinced the National Screw & Manufacturing Company that no one kind of floor will render universally good service.

Instead, the determination of the best type of floor for a particular service has been the result of continual observation and study. The three plants of this company, consisting of 35 buildings, cover a total floor area of 750,000 square feet. These buildings, from one to seven stories high, have permissible floor loadings ranging from 50 to 400 pounds per square foot. Traffic on many of these floors is heavy and concentrated, involving the use of rubber-tired gas and electric tractors to carry loads which often exceed 3 tons. Trailer buggies frequently used with these tractors have steel-rimmed wheels. Also the diversified manufacturing conditions, involve processes that spill water, oil, acids, or grit on the floor surfaces, or cause impact loads. To install a floor not suited to these loads or exposures would mean not only continued maintenance expense but also costly interruptions in the smooth flow of production materials and the creation of accident hazards.

In the following paragraphs are described the various kinds of floors in this company's plants. It is not claimed that these floor surfaces are exclusive in whatever superior characteristics they may have demonstrated. However, until better specifications are found (and they are always being searched for), they do act as comparative standards against which the value of new floor materials can be demonstrated.

Asphalt (acid-resistant). Floor surfacing of acid-resistant asphalt is used in the plating room around the acid tanks and in the drainage ducts. This asphalt of 1½ inches thick, is applied over a concrete base 5 inches thick. Some of this flooring has been in constant use since 1937 and is only now being replaced.

Asphalt (hot mix). Surfacing of hot mix asphalt has been applied in some portions of the yards and drives where little traffic is encountered. It has not been used in places where oil can contaminate the asphalt and soften it.

Under ordinary conditions this surfacing has been good for 20 years, but its life is reduced to 10 years when subject to acid action.

Brick. Hard-shale brick floors are used in the heat-treating departments. In the main heat-treating department, located on the fifth floor, bricks 2 inches thick (bound with acid-resistant mortar) are laid over a 5-in. concrete base. In some of the smaller heat-treating rooms in the old building, this brick is laid directly over a packed wood base. These floors are giving from 20 to 30 years' service.

Concrete (plain). Plain concrete floors are used mainly in the toilets and dressing rooms, because they are durable and easy to clean.

Plain concrete floors are usually made 5 to 7 inches in thickness, without special topping. Average life has been about 8 years.

Concrete (armored). Concrete surfaces with armored grid reinforcement 1 inch deep are used in the open drives and at elevator openings. The advantages of this type of surfacing are long wear and safe footing; its life is double that of plain concrete. The thickness of the plain concrete base of these concrete grid surfaces are between 4½ and 7 inches, depending on the load and soil conditions. Where a soft soil is encountered, a heavier slab or even a steel-rod reinforced slab is used.

Door sills at elevators were originally made of a flat smooth-surfaced steel plate reinforced with angles. This smooth surface constituted a serious slipping hazard and has been corrected by replacing this plate with steel grating filled with concrete.

Magnesite. Magnesite ½ inch thick placed over a resilient ¾-in. base, consisting of wood fiber mixed with concrete, has been in use in the old office building since 1919. From a maintenance standpoint this floor has been very satisfactory. The only parts that have had to be replaced are sections near some time clocks where there was excessive wear, and at a few spots where for no discernible reason the magnesite bulged away from its concrete base.

There are also some magnesite stair treads in the office building, fitted with steel nosings, which have withstood continual traffic for approximately 20 years and are still in good condition.

Maple. Hardwood tongue-and-grooved maple floors of familiar construction, employing ⅞x2¼-in. maple flooring, are in use entirely above the first stories of all factory buildings, and constitute about 90 percent of such factory floors. This type of flooring is laid on wood sleepers embedded in a concrete base or on a packed-wood base, and is of distinct advantage where light machines are in use.

Much extra thought had to be given to overcome the expense in maintaining the maple flooring laid on a sleeper-type base, especially in trucking aisles. This floor is laid over 2x4-in. beveled sleepers with concrete fill with screening in between them. When such a floor was originally installed, the majority of the company's trucking was done with hand-trucks. With the advent of the tractor, more surface wear and multiplied breakage of the tongue and spline of the maple floor were encountered.

The breakage trouble was caused by spaces later occurring between the con-

crete floor fill and the maple floor itself. The heavy trucks, passing over this floor, would flex the boards into these depressions, causing the edging of the flooring to shear and thereby starting the breakdown of the floor surface. The depressions were caused by shrinkage of the concrete fill and to insufficient care in completely filling the space between this fill and the underside of the flooring during construction. When repairs to this type of floorings are currently made, this void is completely filled either with dry concrete, tar paper, or wood, depending upon the depth of the space involved.

Marble. Natural marble slab floors are in use only in the main office lobby. The type of marble used is called Tennessee Pink, which is very hard. In order to keep it in good condition, it must be constantly polished. This produces a slippery surface and has required the installation of rubber mats. These are necessary for appearance as well as safety.

Terrazzo. Terrazzo flooring is used in the engine room and in the dining room for its decorative effect; it is not suitable for sections where there are heavy loads. The terrazzo is approximately 2½ inches thick. In the engine room, it is laid directly over concrete; in the dining room, over a packed wood floor. In the latter case, however, the 1⅛-in. maple wearing surface has been removed and the terrazzo placed on top of the 1-in. pine sub-floor.

Terrazzo floors are scrubbed with soap and water once a week. Where excessive walking is encountered, rubber mats are laid to protect the surface. The oldest floor of this type, still in excellent condition, was installed in 1929, and, from all indications, will last many years longer.

Tile (asphalt). Asphalt tile is being installed in all the newer offices. Thickness of the tile has varied from ⅛ to ¼ inch. The advantages of asphalt tile are that it is soft on the feet, produces a neat decorative effect, is durable, and somewhat absorbs noise. Wherever asphalt tile is being installed in the main office buildings, a non-oil-resistant type is being laid down. However, in the dispensary and factory offices, where oil is often tracked in by workers, an oil-resistant type is being used, because the surface of the non-oil-resistant type has a tendency to soften and pick up and retain steel chips or filings which may be brought in on the soles of workers' shoes.

Asphalt tile is sometimes laid over a magnesite floor by applying a liquid asphalt base, laying the tiles on top, and fitting them together. However, where they must be placed over an old maple floor, it is first necessary to nail a ¼-in. plyboard base to the old floor. Roofing felt is then glued to the plyboard with liquid asphalt, followed by another layer of liquid asphalt on top of the roofing felt. The tiles are then set in. This construction has produced a very satisfactory and durable floor.

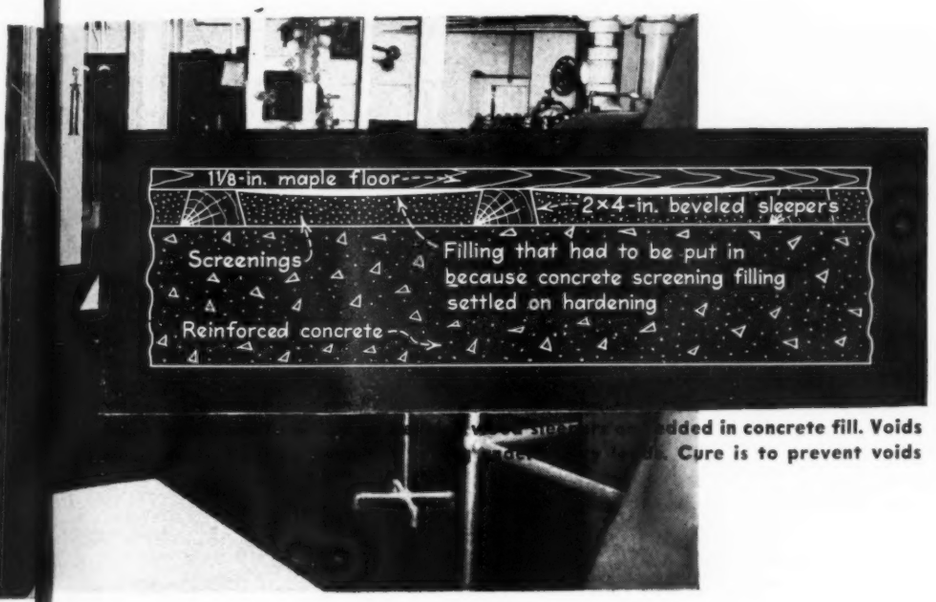
Wood Block. This type of flooring is being used both in the shipping room and on the ground floors of all manufacturing buildings. Floors of wood blocks approximately 2 to 4 inches in thickness are placed directly over a concrete base of 5 to 7 inches. These floors are long wearing, largely because the blocks are installed on end and all wear is therefore on the end of the grain.

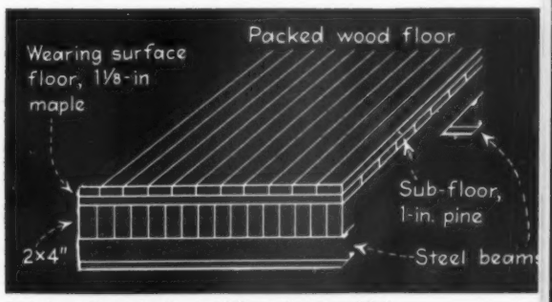
Some wood block floors have been in since 1919 and are still in good condition. Where occasional blocks have proved defective, small sections have had to be replaced—a job that is neither difficult nor costly.

The big difficulty with wood block flooring is that it is not possible to tie a machine directly to the blocks. When a machine needs to be tied down, the wood blocks must be removed, anchor bolts tied into the concrete base, and grouting put in around the base of the machine. In some instances it is possible to fasten down the machine without removing the wood blocks, but a hole must be drilled through the wood block into the concrete base for insertion of a toggle bolt for holding the machine.

Not only floor surfaces but also subflooring and floor bases require and receive continued maintenance inspection. Sub-floors in all buildings are checked about once every 5 years by spot drilling to determine whether the undersurface shows any signs of decay.

Where this condition is found, the floor structure is renewed to eliminate any possible hazards.


1⅛-in. maple floor
2×4-in. beveled sleepers
Screenings
Filling that had to be put in because concrete screening filling settled on hardening
Reinforced concrete



Section of packed wood floor base, which can be covered with various surfaces

dded in concrete fill. Voids Cure is to prevent voids

MANAGEMENT CONTROL FOR STOCK INVENTORIES

R. H. WILSON • GENERAL SERVICE MANAGER, BELL TELEPHONE LABORATORIES, INC., NEW YORK

Money tied up in stock is the major part of the working capital in many industrial organizations. Yet management, although deeply concerned, does not have the same measure of control over this money as that exercised over other money invested in the business.

To insure this close control of stock materials, Bell Laboratories has developed a simple routine based on the law of probability, which, when applied to past disbursements of an item, gives a reliable forecast of future demands. Once the forecast is determined, it can then be used with assurance in a simple table to determine the most economical lot size to manufacture for stock. The table not only takes into account the economic factors shown later which are associated with stockroom operation, but also includes the set-up charge and the basic manufacturing cost of the item.

This plan of operation insures that items self-manufactured for stock will be on hand when required, at the lowest over-all manufacturing and operating cost.

The control of items purchased from outside suppliers presents a different problem, because the set-up charges and the basic manufacturing costs do not have to be taken into account. As with self-manufactured items the aim is to operate with as low an operating cost as possible consistent with maintaining enough stock on hand to meet all normal demands.

In an endeavor to accomplish this aim, several methods of stockroom operation are now in general use. For instance, in some concerns general instructions are issued to order stock material on a specific time basis for different groups of items, such as a three months' supply for each item in one group. Although this has the appearance of control, the examples shown later will prove that it is far from the most economical method of operation.

Still other companies simply leave the determination of how much and when to order for each stock item in the hands of experienced rank-and-file employees. As a result, management has no control over the money invested, since the rank-and-file employees are, in effect, determining the level of inventory, and they do this solely on the basis of past experience, judgment, and any available knowledge of future demands. The inaccuracy of this method can readily be tested by asking employees of similar business experience to determine how much stock to order for any selected item and observing the different solutions received, although obviously all cannot possibly be correct.

There seems to be a definite pattern or cycle of events in stockroom operation in most organizations. When a troublesome out-of-stock condition arises, management usually seeks to remedy this condition by exerting pressure on the group or on the individual employee controlling stock. The result is an increase in minimum stock quantities, and possibly an increase in the amount of stock ordered, which in turn causes an abnormal increase in inventory. As the inventory increases to a point where it is no longer considered economical, management again brings pressure to bear in an effort to reduce it. As a result, less stock is ordered, or the minimum stock quantities are reduced, and soon there is a repetition of the troublesome out-of-stock condition. Thus management seesaws between low inventories with a high out-of-stock condition and high inventories with a low out-of-stock condition.

Two essential difficulties prevent management from obtaining the desired balance of control:

1. Most forms of control are attempted on an average basis, whereas each item should be controlled so that the most economical amount is carried.

2. Management has not been provided with the knowledge necessary to instruct their employees in a method of operation which will enable them to achieve this result.

This article shows management how to obtain this desired balance of control. It describes a plan that permits management to control the inventory and the out-of-stock condition by providing the stock control group with simple routines based upon the company's operating factors. This enables members of the group to select the most economical ordering amount and ordering point for each stock item, thus resulting in a stable and predetermined over-all value of inventory as well as protection.

The two basic problems in controlling stock items are: (1) The determination of the most economical amount to order, and (2) the determination of the quantity of stock that should be on hand when a restocking order is placed. This quantity called the "ordering point" must be sufficient to provide the required protection against going out of stock. The problem of determining the most economical amount to order will be considered first.

HOW MUCH TO ORDER

Items from outside suppliers. Generally speaking, the only factors taken into account by the employee ordering stock from outside suppliers are the past activity records of the item and any knowledge available regarding future requirements.

Some of the basic economic factors usually *not* considered are interest on investment, depreciation, obsolescence, insurance, and such costs as are incurred in order placing, receiving, inspection, distribution, and paying the bill. Although it is readily understood how impossible it would be to expect

someone to weigh each of these factors individually when placing an order, the following illustration shows that they must be taken into consideration in order to be able to select the most economical ordering amount.

For example, suppose that $1000 worth of a stock item is consumed annually. There are obviously thousands of different ways in which orders might be placed with outside suppliers for this amount during a year. For instance, one order could be placed for the full $1000 worth; or two orders could be placed for $500; or four orders could be placed for $250; or 40 might be placed for $25. The exhibit on page 145 is a simple illustration which takes into account the basic economic factors already referred to and includes them in (1) the cost of carrying stock and (2) the cost of replenishing stock.

COSTS VARY

Since the amount ordered during the year is varied between a single order for $1000 and twenty orders for $50 totaling $1000, the over-all yearly cost of operation also varies. It will be noticed on the lower line *F* that for one certain amount ordered the yearly cost of operation is less than for any other. Also, since line *C* is a measure of the inventory carried, it is apparent that the lowest inventory does not necessarily mean the most economical operation. Should orders for $50 be placed instead of $125, thereby decreasing the inventory, the operating costs in this instance would rise from $14.25 to $22.50 or an increase of 53 percent. If this should occur for all stock items, it would represent a real loss in money for no gain in efficiency of operation.

From a study of this exhibit it is obvious that any method which attempts to control the inventory by establishing a given amount to order for any items, such as a three months' supply, etc., is economically incorrect.

It is unnecessary to go through the type of calculation given in the exhibit to determine the most economical ordering amount for each item. Mathematical study has resulted in a formula using the basic principles of the exhibit with a factor added to take care of the effect of the ordering point in the determination of the most economical amount of stock to order. Through the use of the formula a table (see top of page 144) can be prepared, which takes into consideration all necessary operating factors as they exist in any given stockroom and enables the stock control personnel easily and accurately to select the most economical ordering amount for any stock item obtained from outside suppliers under routines set up and controlled by management.

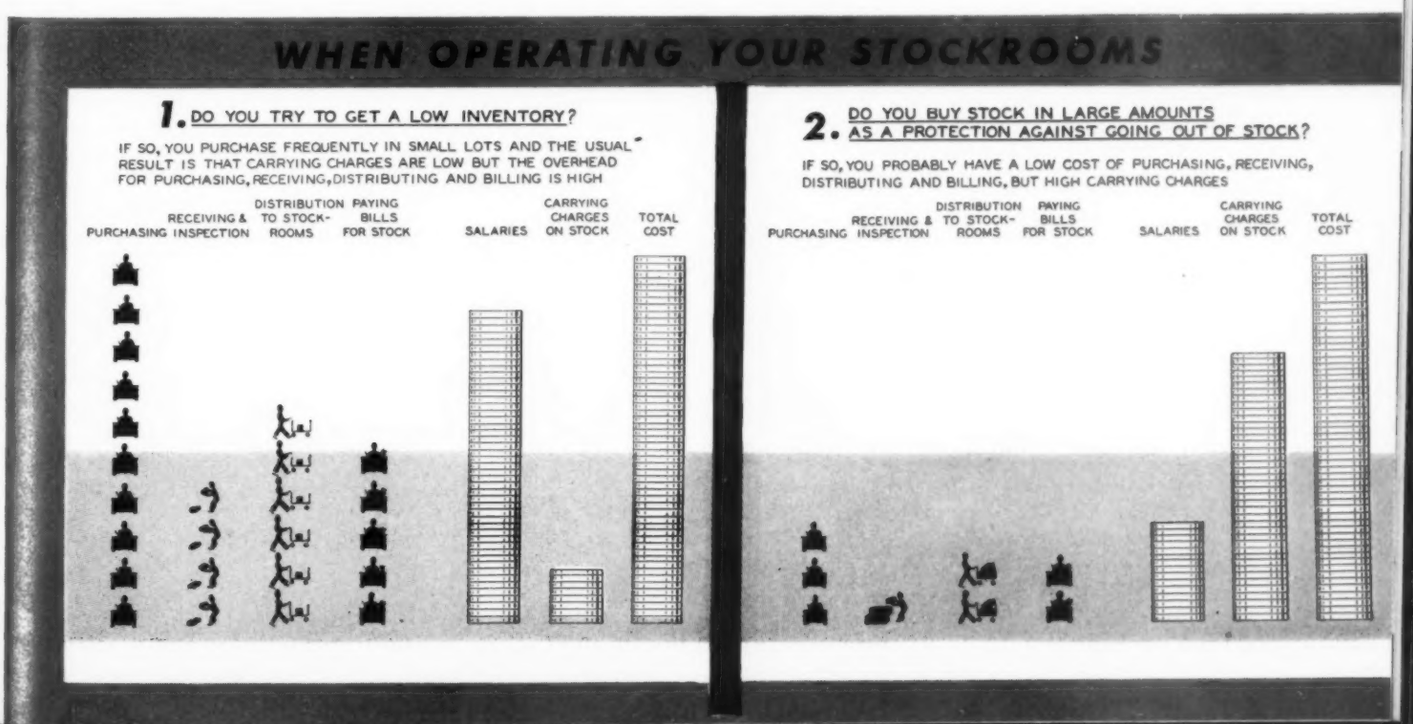
Example. From the stock record an item is found to be moving at the rate of $160 per quarter, and there is nothing to indicate that this rate will change materially in the next few months. The stock control employee refers to a table prepared for this particular stockroom, which has been simplified through use of the formula, so that only two columns are necessary. In the first column is found the quarterly demand in dollars for the item under consideration, and adjacent to this figure in the second column is given the amount to order, expressed in dollars. In this example, for a quarterly demand of $160 the ordering amount is $140. This is the most economical ordering amount, taking into consideration the economic factors associated with the stockroom.

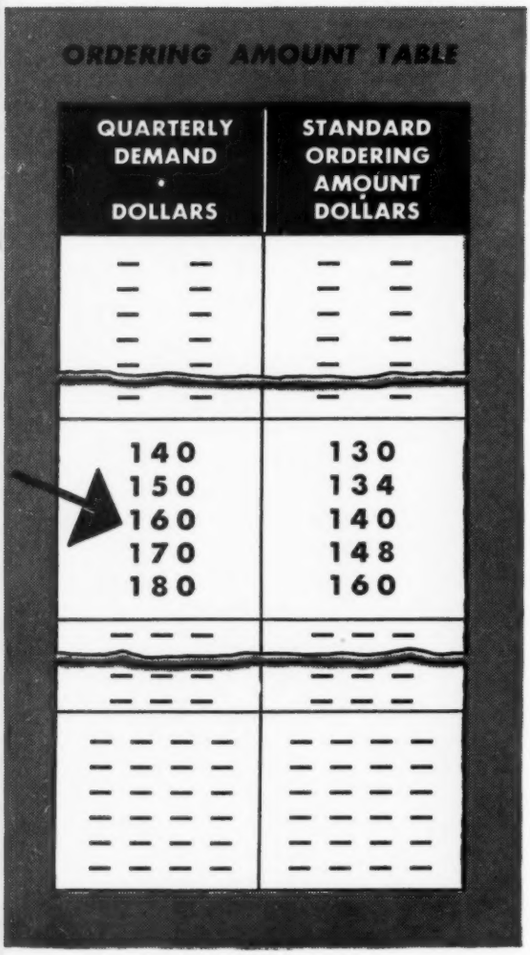
Any anticipated change in future demands would simply change the figure of $160 to a new anticipated quarterly rate at which the item will move, and the amount to order would then be opposite this new figure in the table. When the quarterly demand figure is small, the table indicates a large number of months' supply to order; however, as the dollar value of material consumed increases, the number of months' supply to be purchased decreases rapidly for economical operation. As a result the over-all inventory is, in general, kept at a low figure unless a large number of slow-moving items are kept in the stockroom.

The ability to estimate accurately future material requirements is a major factor in the successful operation of most organizations.

Self-manufactured items. When an attempt is made to estimate self-manufactured stock material requirements on the basis of a future sales program, the estimated figure is bound to be distorted by a great many factors such as variations in market conditions, unpredictable changes in shop schedules, and other unaccountable circumstances which are almost impossible to forecast.

When it is further realized that a single stock item may be common to a


WHEN OPERATING YOUR STOCKROOMS
1. DO YOU TRY TO GET A LOW INVENTORY?
IF SO, YOU PURCHASE FREQUENTLY IN SMALL LOTS AND THE USUAL RESULT IS THAT CARRYING CHARGES ARE LOW BUT THE OVERHEAD FOR PURCHASING, RECEIVING, DISTRIBUTING AND BILLING IS HIGH
PURCHASING
RECEIVING & INSPECTION
DISTRIBUTION TO STOCK-ROOMS
PAYING BILLS FOR STOCK
SALARIES
CARRYING CHARGES ON STOCK
TOTAL COST
2. DO YOU BUY STOCK IN LARGE AMOUNTS AS A PROTECTION AGAINST GOING OUT OF STOCK?
IF SO, YOU PROBABLY HAVE A LOW COST OF PURCHASING, RECEIVING, DISTRIBUTING AND BILLING, BUT HIGH CARRYING CHARGES
PURCHASING
RECEIVING & INSPECTION
DISTRIBUTION TO STOCK-ROOMS
PAYING BILLS FOR STOCK
SALARIES
CARRYING CHARGES ON STOCK
TOTAL COST



number of articles, each of which has its individual sales program and variations, it is readily understood why methods now in general use, which embody only the factors mentioned in estimating future demands of a self-manufactured item for stock, are in most cases unreliable and inaccurate.

Through the use of the following method, however, which has as its basis the law of probability, an accurate estimate of the demands for any given stock item can be calculated. Monthly disbursements from stock for the item under consideration are obtained for the past five months. The variations that occur in these disbursements are observed, and then by simple calculation a figure is obtained which is the best estimate of future monthly demands based on past experience. This figure can then be modified if any unusual circumstances occur which definitely indicate that the demand might increase or decrease; otherwise the figure is used as originally calculated in a table prepared from a formula similar to that discussed under "items from outside suppliers" and demonstrated in the exhibit on the left to determine the most economical lot size to manufacture for stock.

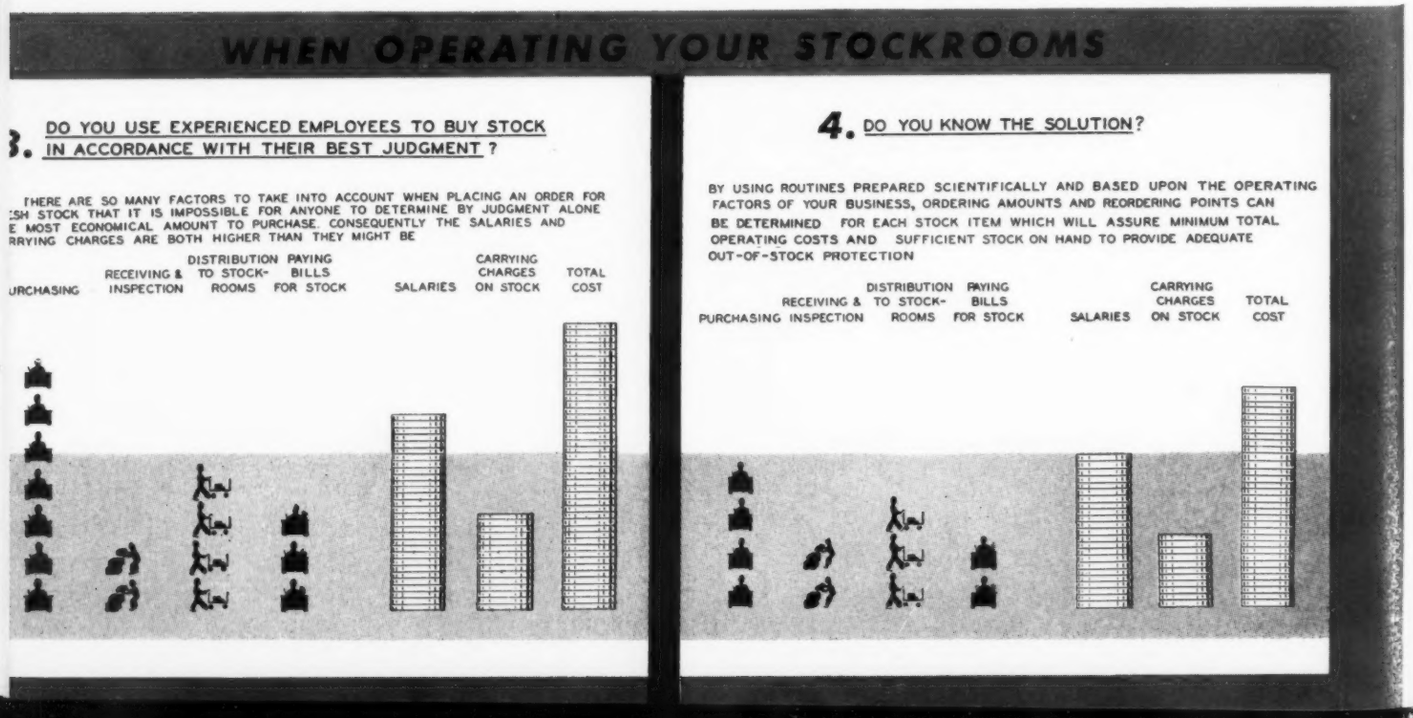
In the preparation of this table, however, both the set-up cost and the unit manufacturing cost are taken into account as well as the standard factors of carrying and replenishing stock already described. The reason for this is that when stocking is the only consideration it may be economical to order only a small amount. However, if a manufactured item entails a high set-up cost, it will obviously be necessary to increase the quantity ordered so that a balance between set-up cost, basic unit manufacturing cost, and stocking costs would result in the most economical lot size to manufacture for stock.

Rising or Falling Markets. After the standard ordering amount for an item obtained from suppliers has been determined, it may be found that because of discounts or rising or falling markets an adjustment may be necessary in the standard ordering amount to increase over-all economies further Tables can be prepared that will show whether or not such an adjustment is economical.

WHEN TO ORDER

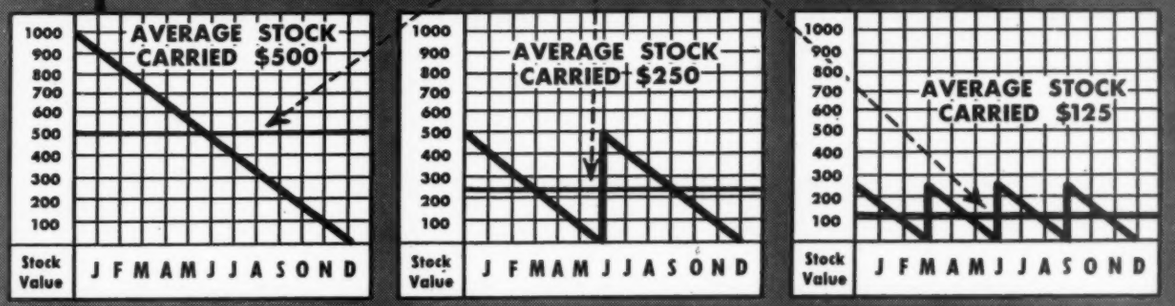
The other basic problem of stock control is the determination of the quantity of stock that should be on hand when a restocking order is placed. This is of considerable importance for two main reasons. First, to run out of stock on an item may cause disruptions resulting in a greater loss than the actual value of the stock carried for protection. Second, a large quantity of excess or safety stock, which is a result of placing restocking orders when there is too large a quantity of stock on hand, represents a great deal of capital tied up in stock not being used.

The most common method now in operation for controlling the out-of-stock condition is to establish a "minimum stock" quantity which is determined on a time basis for all or most items. For instance, management may set the minimum stock for all items or all items in a selected group at six-weeks', two months', or six months' supply, depending on the over-all out-of-stock condition. Management tends to set this amount as low as possible, which usually results in a troublesome out-of-stock condition. To counteract


WHEN OPERATING YOUR STOCKROOMS
3. DO YOU USE EXPERIENCED EMPLOYEES TO BUY STOCK IN ACCORDANCE WITH THEIR BEST JUDGMENT ?
THERE ARE SO MANY FACTORS TO TAKE INTO ACCOUNT WHEN PLACING AN ORDER FOR SH STOCK THAT IT IS IMPOSSIBLE FOR ANYONE TO DETERMINE BY JUDGMENT ALONE E MOST ECONOMICAL AMOUNT TO PURCHASE. CONSEQUENTLY THE SALARIES AND RRYING CHARGES ARE BOTH HIGHER THAN THEY MIGHT BE
URCHASING
RECEIVING & INSPECTION
DISTRIBUTION TO STOCK-ROOMS
PAYING BILLS FOR STOCK
SALARIES
CARRYING CHARGES ON STOCK
TOTAL COST
4. DO YOU KNOW THE SOLUTION?
BY USING ROUTINES PREPARED SCIENTIFICALLY AND BASED UPON THE OPERATING FACTORS OF YOUR BUSINESS, ORDERING AMOUNTS AND REORDERING POINTS CAN BE DETERMINED FOR EACH STOCK ITEM WHICH WILL ASSURE MINIMUM TOTAL OPERATING COSTS AND SUFFICIENT STOCK ON HAND TO PROVIDE ADEQUATE OUT-OF-STOCK PROTECTION
PURCHASING
RECEIVING & INSPECTION
DISTRIBUTION TO STOCK-ROOMS
PAYING BILLS FOR STOCK
SALARIES
CARRYING CHARGES ON STOCK
TOTAL COST

Changes in operating costs when orders are placed in different ways for a stock item which moves at the rate of $1000 per year

(a)	NUMBER OF ORDERS PLACED PER YEAR	1	2	4	5	8	10	20
(b)	SIZE OF EACH ORDER	$1000	$500	$250	$200	$125	$100	$50
(c)	AVERAGE STOCK CARRIED	$500	$250	$125	$100	$62.50	$50	$25
(d)	COST OF CARRYING AT 10 PERCENT	$50	$25	$12.50	$10	$6.25	$5	$2.50
(e)	COST OF PLACING ORDERS AT $1 EACH (SEE A)	$1	$2	$4	$5	$8	$10	$20
(f)	TOTAL YEARLY COST OF OPERATION (d) + (e)	$51	$27	$16.50	$15	$14.25	$15	$22.50



this condition, management then increases the minimum stock on hand for every item in the group causing trouble to a point where the out-of-stock condition is reduced to a satisfactory level. Although this will temporarily solve the out-of-stock problem, the quantity of safety stock is obviously being increased for many items which might instead be reduced, thus creating a large unnecessary inventory with its associated increase in operating costs.

What management really needs is a plan that will adjust the amount of protection for each item according to its individual requirements.

After considerable study it was found that there are three basic factors common to all stock items which enter into the out-of-stock problem regardless of whether the items are bought from suppliers or manufactured. These are (1) number of requests for an item during the restocking time, (2) number of units per request for the item, and (3) time elapsed from the time an order is placed until it is filled.

These basic factors follow definite mathematical laws including the law of probability. Thus it has been possible to prepare tables which allow management to select protection for a stock item or class of items ranging from "never out of stock" to the least degree of protection necessary for efficient operation. Following a simple routine, these tables permit the employee to estimate accurately from past records the level to which a particular item should drop before a restocking order is placed. In this way, management exercises control over inventory by being able to maintain it at its most economical level while still meeting the necessary requirement for service.

PROVED BY TIME

This plan of controlling the out-of-stock condition with its associated routines, has been in actual operation for the past ten years, including the hectic war period, during which time it has been proved that it can be used with confidence and accuracy.

It was found from a recent study that stock items obtained from outside suppliers which did not have out-of-stock problems could be maintained with a considerably lower level of inventory and still not go out of stock, while items which did have costly out-of-stock conditions could be managed in a manner which would eliminate this problem.

The over-all plan described in this article assures management of complete control of stock materials by placing in the hands of the stock control personnel a tool, prepared and approved by management, which can be used with precision in ordering stock and controlling the out-of-stock condition.

Installation of this plan requires a minimum training program for employees since it uses records and information which are in most cases already available. It can be installed with practically no interference with current operations. Not only, therefore, is this plan simple to operate, but in addition to providing greater economy and accuracy, it places control in the hands of management.

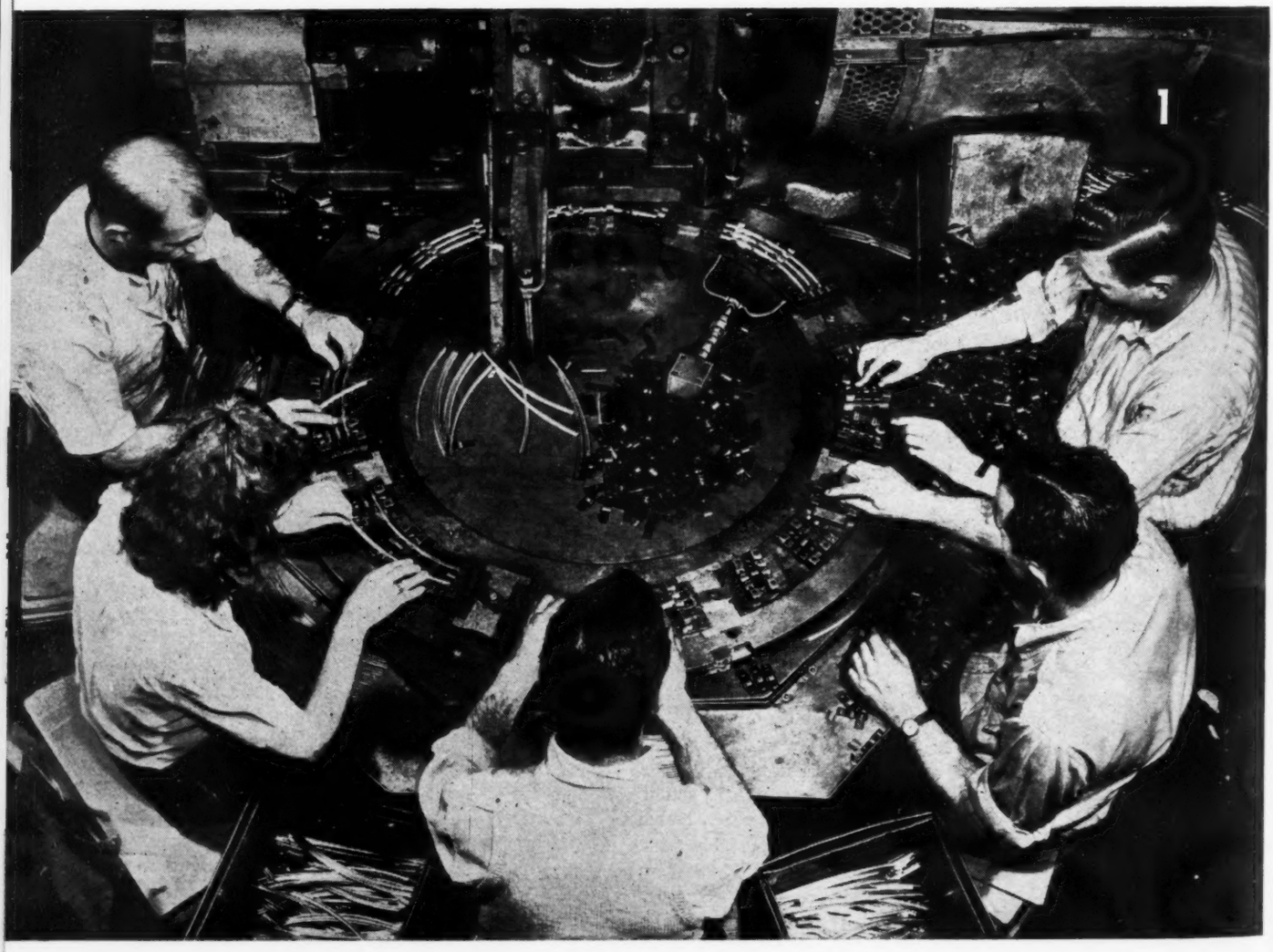
DOUBLED VOLUME, LOWERED COST, BY WORK SIMPLIFICATION

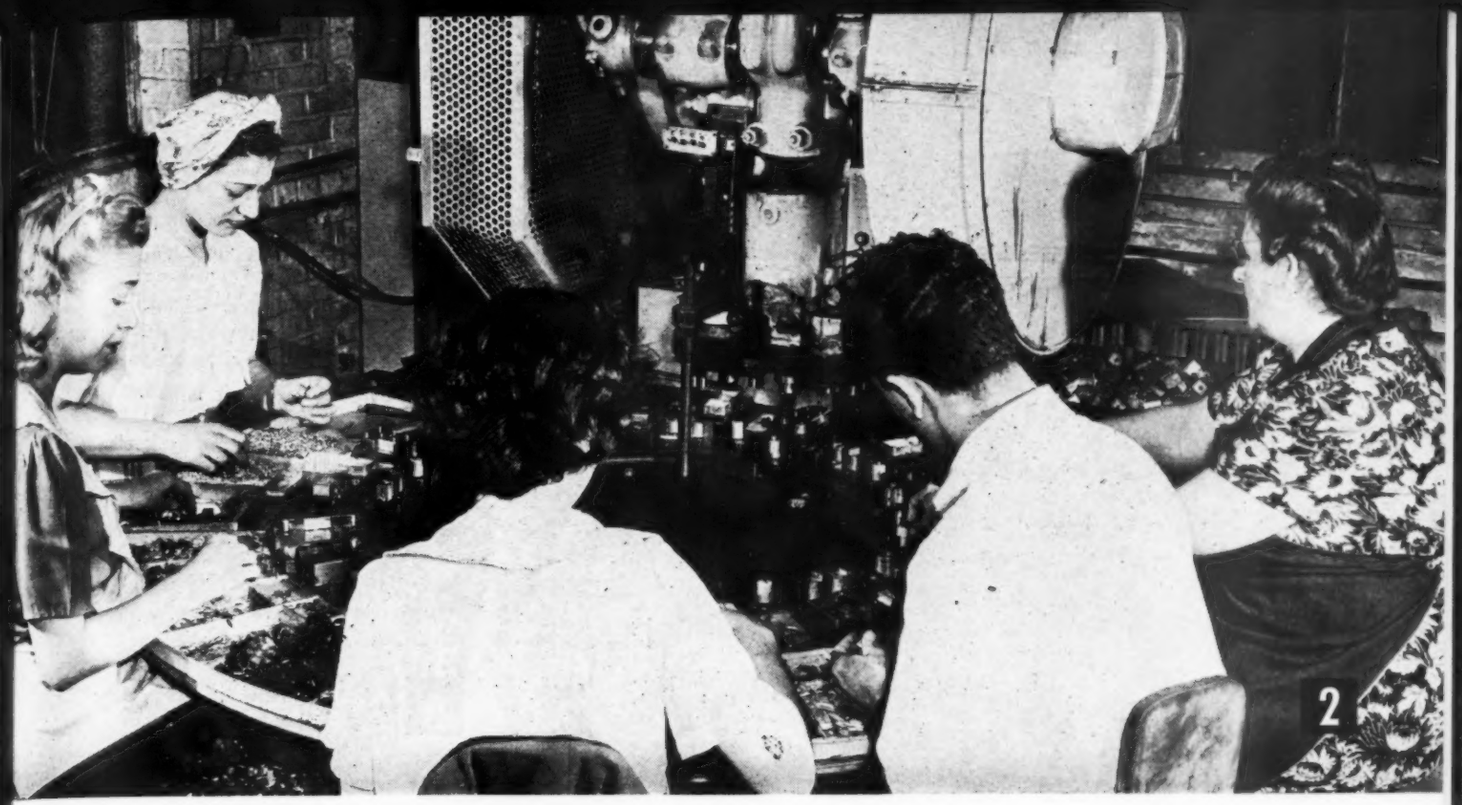
CHARLES V. GIAIMO • WORKS MANAGER, THE LIONEL CORPORATION
IRVINGTON, N. J.

Double its pre-war dollar volume is the objective at Lionel. Not long ago, the burden of such a project would have fallen most heavily on the sales force; the problem today is one for production men and methods engineers.

To speed production and cut unit costs, the company has embarked on a program which calls for making the maximum use of the principles of work simplification, subassembly, and the division of labor. The manufacture of Lionel's line of toy trains and the equipment, parts, and accessories for them, calls for the production of hundreds of different units and subassemblies, requiring all degrees of skill on the part of the workers. For this reason, one of the main points of attack has been to assure that work is so divided that in no case is a higher degree of skill—at a necessarily higher wage—than required being used on a job, or on any part of a job.

Individual installations developed for this program range all the way from intricate multi-station dial assembly units to simple wood chutes which cut fractions of a second from an operation by eliminating a long reach.

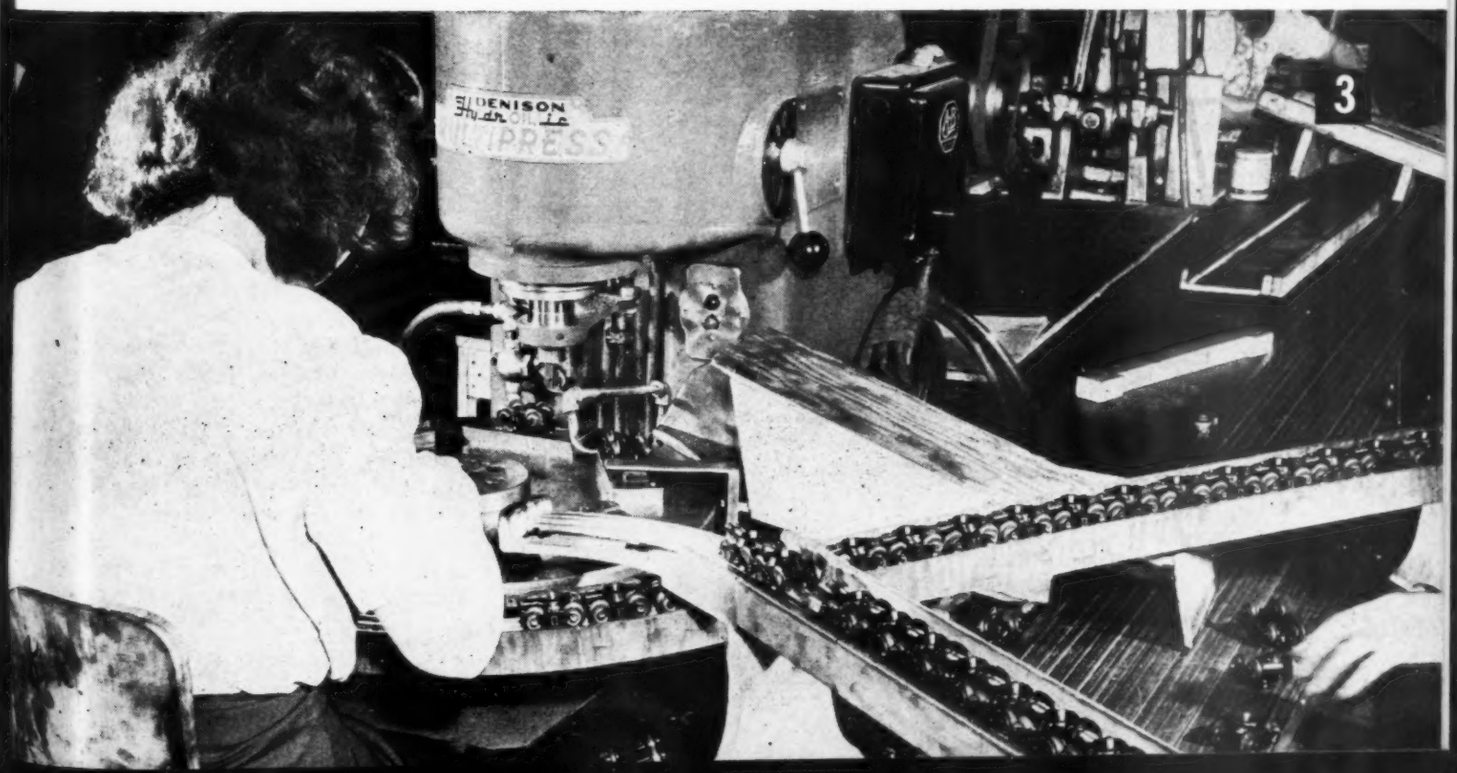


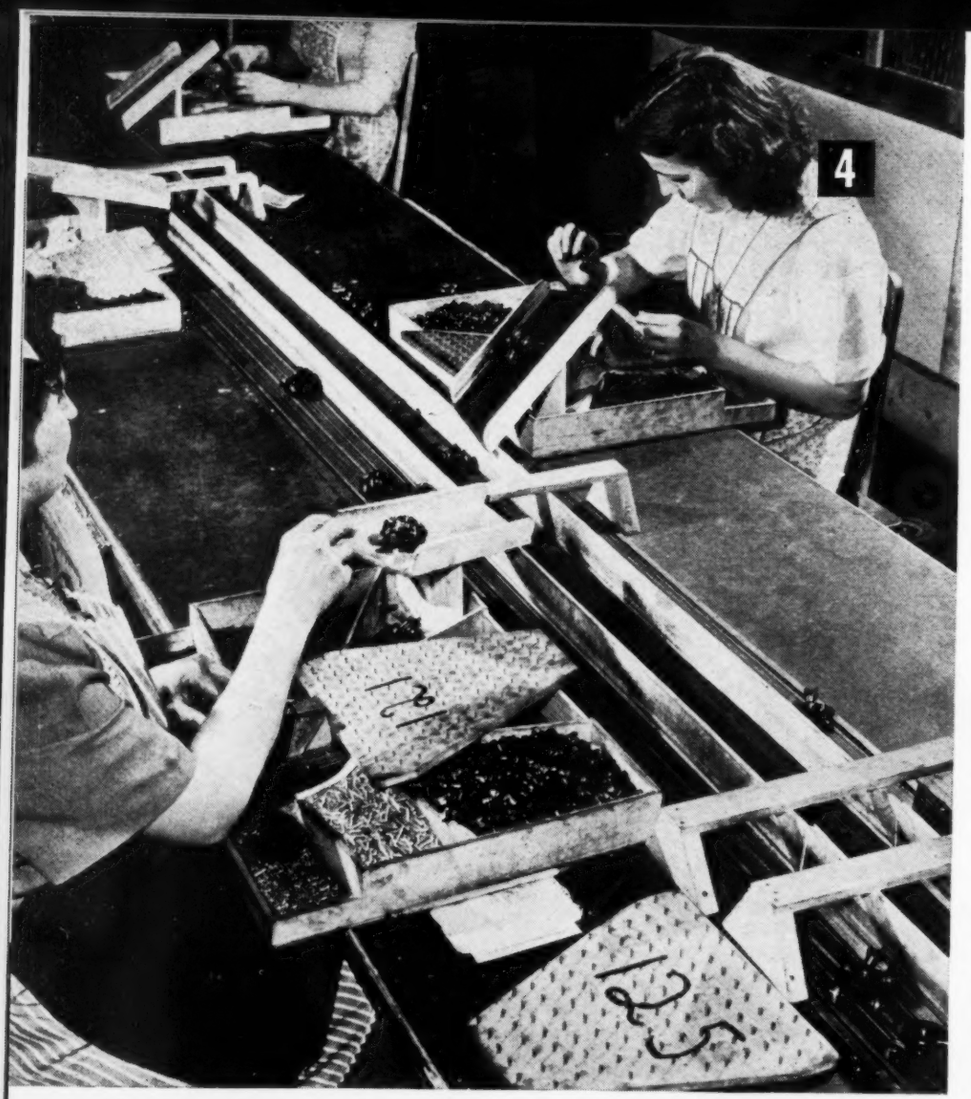


1 High-speed dial assembly with hydraulic stamp press turns out 28 curved track sections per minute. With operations for the five-man crew balanced to the split second, man on right inserts one tie in jig, keeps second operator supplied with parts, manipulates "on and off" foot switch. Next man places two more ties in the jigs, and successive operators place one rail in position. Extra "station" at upper left allows nearest operator chance to inspect parts for proper positioning in jig before it passes under press. Tandem air jets (at 1 o'clock position on the dial) blow the completed track section out of the jig and into a chute which carries it directly into a box truck, ready to be wheeled away to the packing room in another part of the plant.

2 Eight separate stamping operations are necessary to make a completed whistle unit on this dial assembly. Each of the workplaces has eight "stations" on the dial section in front of it. When unit is set up, no completed assembly is produced the first seven times around; the stations are being progressively filled with in-process work. On and after the eighth trip, a finished unit is turned out each time the dial moves. The work is balanced so that each operator performs one or two tasks. For example, at each dial movement, girl in foreground takes part from station 4, lubricates bearing, places fin from pile at left on it, and returns part to station 5. The others work in similar fashion, so that all the operations are repetitive.

3 Railroad car "trucks" are delivered from one operation to the next on track sections which carry them across moving conveyor belt. To balance the team,





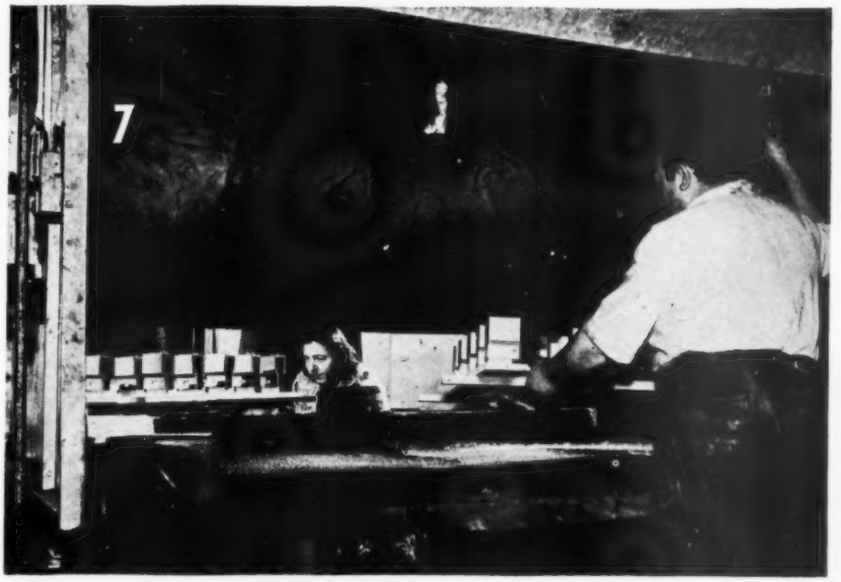
two girls on the right remove trucks as they come down the belt, attach coupler coil assembly, and place unit on the cross-belt tracks. Terminals of these tracks are so placed that press operator can handle trucks with both left and right hands. Tracks are crossed on terminal side in such a way as not to interfere with movement of operator's right elbow. As in Figure 1, air jet blows finished piece into chute. Note that arrangement of chute is such that all work is delivered to the side of the conveyor belt which is handiest for removal of the part at the next work station.

4 Reaching is expensive; so is the extra time involved in separating completed from to-be-processed work on a moving conveyor. Divider boards along conveyor insure separation, keep pieces to be removed from belt closest to the operator. All parts necessary for assembling the knuckle for the automatic uncoupler device are placed in modified circular work space trays in front of each girl. The tiny springs for the assembly are mounted on pegs set in a board; when half empty, board is turned around to bring remaining springs closer. Springs are initially placed on pegs by unskilled workers in another room, and movable boards are brought fully loaded to the assembly operators. After piece is removed from the fixture in which it is held during the assembly, it is placed in a simple wood chute which delivers it to the middle aisle of the moving conveyor.

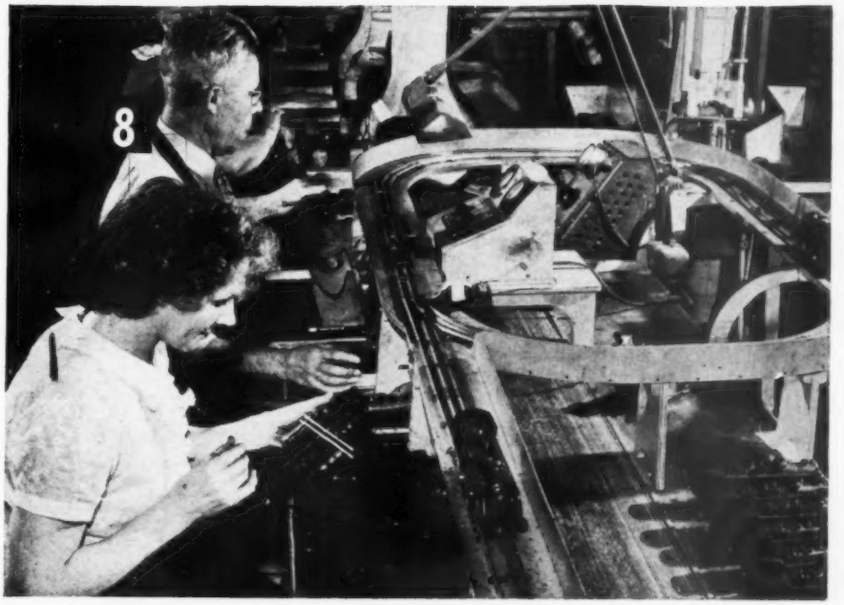
5 Grooved boards starting in foreground deliver wheel and axle assemblies from the four women at the near end of the bench to the team of six at the remote end. They take pairs of these assemblies, add truck sides and frames to make a complete truck assembly. These are then placed on the more steeply inclined boards in the center, down which the trucks roll to the punch operator. Taking the trucks two at a time, he stamps them to make assembly permanent, places them directly on conveyor for later operations. Abnormally long reach of the woman in left foreground was to permit photographer clear view of entire team; ordinarily she sits much closer to the table. Assistant superintendent in charge of production, John Giampolo, standing left rear, checks up.

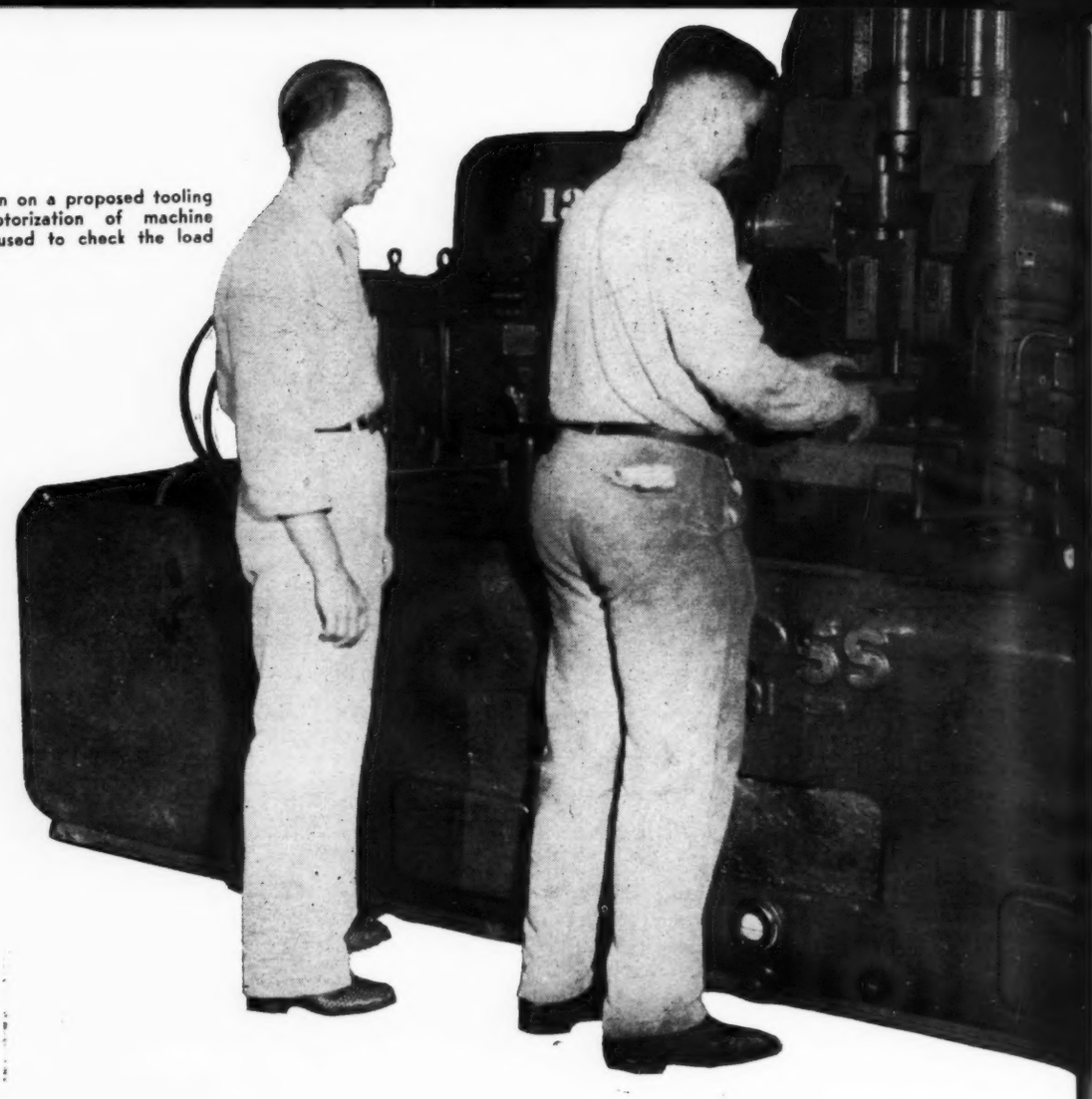
6 Modern version of the "Lazy Susan" on a transformer assembly line. Identical jigs on either end of pivoted board permit the man at left to take partially completed transformer from moving conveyor, position it in the jig, and make the necessary electrical connections at the same time that the girl opposite is soldering the contacts. While the man is finishing his operation, she removes piece from jig, places it back on the conveyor belt. Entire operation is so timed that while she is picking up soldering iron and wire, teammate swings board around, bringing next piece to her for soldering. Wire-form solder comes from reel so placed that there is no fumbling or searching for it when preparing for next operation. Iron, too, rests in convenient angle holder, eliminating the possibility of grasping the hot end or knocking it onto the floor.

7 It costs money to wait, so paint spray booth is arranged to cut time from finishing of one batch until next is in position. No longer does the sprayer have to wait for someone to unload and reload the rack in the booth; this is now done behind the booth, while he is spraying. Twin racks are mounted on swivels at each end of a pivoted arm. As soon as he has finished spraying one batch, he kicks a foot lever which raises the back of the spray booth, rotates the arm to bring the next batch into position, then closes back of the booth. By having both spraying and loading going on simultaneously, it is not necessary to pay both a loader and a sprayer—who would be waiting—for the time consumed by the loading operation.



8 The principle of "self-transportation" illustrated in photographs 3 and 5 reaches its ultimate development at the final inspection of locomotives. Tester places completed unit on the track, where it goes around oval section once, and then almost literally "runs itself into the packing case." As train comes along track, woman in foreground removes it, places small bit of grease on the bearings, if necessary, then puts locomotive onto conveyor which carries it to packers. If no grease is necessary, and no defect is obvious, the track, which parallels the conveyor, can carry the locomotive to packers at end of the line.





Electrician checks power consumption on a proposed tooling operation. To assure proper motorization of machine tools, a recording wattmeter was used to check the load

HOW WE MODERNIZED FOR LOW-COST OPERATION

J. R. CLEMENS • PLANT ENGINEER, AND R. G. HAWLEY • PLANT LAYOUT ENGINEER, LINK-BELT COMPANY, PHILADELPHIA

Faced with the need to manufacture better products at lower costs in its Nicetown plant in Philadelphia, the Link-Belt Company decided upon a thorough modernization program.

A preliminary survey showed the company's buildings to be badly in need of repair. Owing to old equipment and poor plant facilities, production costs were out of line with those of newer and modern plants. Production could not keep pace with the demand, and the manufacture of several new products required additional facilities.

Naturally, the alternatives of building a new plant or modernizing the old one had to be considered. On the one hand, the average age of the buildings was 38 years—the oldest, 58 years. The plant's shop and office buildings were located on a rectangular plot hemmed in on two sides by railroads and on the other two sides by city streets. There was little room for expansion, and no adjacent land was available. Power, lighting, heating, ventilating, and sewage systems were either inadequate or overloaded. Unsatisfactory working conditions prevailed in many areas. Rehabilitation would not be easy.

On the other hand, there was the pressing need for higher and cheaper production in the shortest possible time. Difficulties in the time element and in building materials shortages loomed seriously as opposing factors in considering new plant construction. It was decided to retain and modernize the present plant.

A three-stage program was set up, first to reveal the existing deficiencies, and then to chart improvements:

1. *Plant layout.* This involved a study of plant buildings with respect to layout, flow and handling of materials, equipment, methods, tooling, inspection, power, light, heat, ventilation, and other working conditions, with an over-all objective of increasing production and reducing costs.

2. *Buildings and equipment.* Improvements were sought in physical plant by modernization of old buildings and equipment, addition of new buildings wherever possible on existing property, relocation of old machine tools, and purchase of new equipment.

3. *Production methods.* Existing practices were reviewed to perfect the methods of tooling, inspection, production control, and wage incentives.

To start this program, the first thing necessary was to establish the nature of the products to be manufactured. To determine how much of each product was to be made, sales of all models, types, and sizes of standard and special products were charted for the preceding 4 years. Then the engineering department was consulted in reference to contemplated changes in design, or details of new models, to get a picture of what the modernized plant would have to manufacture. Finally, the sales department contributed its estimate of future sales of all products.

PRODUCTION PREVIEWED

With the over-all manufacturing objectives now clearly defined, each item was charted as to production required per month. Then, with the help of the manufacturing division, each item was analyzed to see how it could best be put into production.

From this point, the types and sizes of machine tools, tooling required, etc., were determined. Synthetic time studies were made to compile time elements and also to derive approximate costs. Having this information, machine loads could be figured, and it could be decided whether to replace present equipment, or continue to use it with possible changes in jigs, fixtures, and the like.

Flow and handling of materials next came up for attention. Studies were made of movement of materials, beginning with the receipt of raw materials, tracing them through the various stages of manufacture, and ending with the shipment of finished products. A formidable problem was encountered in the fact that the plant had grown over a period of many years, and had several different levels of one-story construction in some areas and two-story construction in others. Weight of finished products varied from ½-lb. sprockets to 20-ton grain car unloaders. Average weight ran around 35 pounds.

In the old layout, machines and operations were arranged departmentally. In many cases material had to be transported long distances between successive operations. Moreover, the same machines might handle large production runs of "standard" lots at one time, followed by a special set-up for a one-of-a-kind "engineering" job, or for short runs of "semi-standard" job lots.

To avoid this costly admixture of unrelated work, the plant was laid out in three separate manufacturing divisions, to make "standard," "semi-standard," or "engineering" products. Each division was then treated as a separate manufacturing plant.

A final survey of requirements revealed that all but two machines in the plant had to be moved, and that the total number had to be increased by one-fifth. Some machines had to be rebuilt so they could produce work to the tolerances required. Also, many of the older machines had to be taken off line shafts and individually motorized before they could be used in their new locations.

In planning the new layout, a plat of each floor area was made to scale (⅛ inch per foot). Two-dimensional cutouts of all machine tools and equipment were made. The cutouts were set up on the plats and the results studied for material flow. After many conferences with departmental heads of the various divisions, and then with supervisors of the sections, the layout was finally settled to everyone's satisfaction as to relative location and specific position of all machine tools. A total area of 267,000 square feet was involved.

The next task was to transfer the entire plan into sets of working drawings, usually made at ½-in. scale, showing in detail each machine location. Separate plans were made of machine foundations, wiring, lines for air, water, and gas, so that the machine could be quickly installed and connected. Then whatever service equipment was needed for actual operation was shown on other working drawings, completing what was probably the most difficult stage—planning—of the modernization program.

From the general outline of planning just given some idea of the problems faced in the second stage of modernizing an old plant and pre-war equipment must be evident. In the following sections some of the more important or unusual problems will be given, to show how or to what extent they were solved:

1. *Machine power consumption checked.* A major decision was the adoption of carbide tooling for obtaining increased production from existing machine tool equipment, which involved higher machine speeds and feeds, and therefore required more power. To assure proper motorization of machine tools, a recording wattmeter was used to check the load. Tool design was also influenced by this same test, because if tools were improperly ground or made, the machines pulled more power. In one instance a change from a positive to a negative tool rake working on cast iron substantially reduced power requirements. This testing technique is now being used continuously in the plant to perfect all new tooling and assure lowest power consumption.

2. *Tooling time reduced.* Provision of a distribution toolroom adjacent to the production machine shop on the first floor reduced worker's time in traveling to what was formerly the only toolroom, on the second floor. Average saving in time, 20 minutes per worker per day.

3. *Tool accuracy helped.* An air conditioned gage room was installed alongside the new distribution toolroom, for checking purposes. No excuse now for inaccuracies.

4. *Raw material flow simplified.* New shipping and receiving departments for truck shipments were located in a new building with protected platform, to eliminate long transport through the plant and to speed up activities by reduction of truck congestion in the yard. Previously, various scattered outdoor platforms were used. The new location was spotted in the front and center of the plant among three existing buildings so that raw and finished materials now flow into and out of all three manufacturing divisions without crisscrossing or confusion.

5. *Inspection procedures improved.* New inspection departments were set up in each division in line with the flow of materials. There had been just two inspection departments in the entire plant area, to which finished products had to be hauled on hand-trucks. Also, extra expediters were needed to push the materials through. Now, first things come first and quality never suffers.

6. *Elevator eliminates back-travel.* An elevator was installed from the first floor machining department to the second floor assembly department to avoid

back-travel to existing elevators. This elevator was located right at the last machining operation to continue the smoooth flow of material.

7. *Long transports eliminated.* The "engineering" machining department was moved next to the fabricating department to save long material transport. Similar changes in layout and routing of "production" castings reduced their total transport from 6280 to 580 feet. Formerly, these castings traveled back and forth over two floors and through the yard. Now they come in the machining department at one end and flow out the other.

8. *Storage racks release space.* Overhead storage racks were provided in the carpenter shop for large wood templets, and in the steel shop for structural shapes, to release floor space for manufacturing operations.

9. *Continuous flow speeds output.* In the carpenter shop where packing cases are made, the layout was changed to have the raw materials flow in at one end and finished boxes out the other, instead of using what was formerly the only entrance for both purposes. Besides less confusion, more production resulted.

10. *Palletized storage obtained.* In order to obtain needed storage space, part of the discontinued truck driveway was roofed over to provide an area for electric motor storage. Handling of motors was simplified by use of pallets to hold motors, which are tiered with a new fork lift-truck.

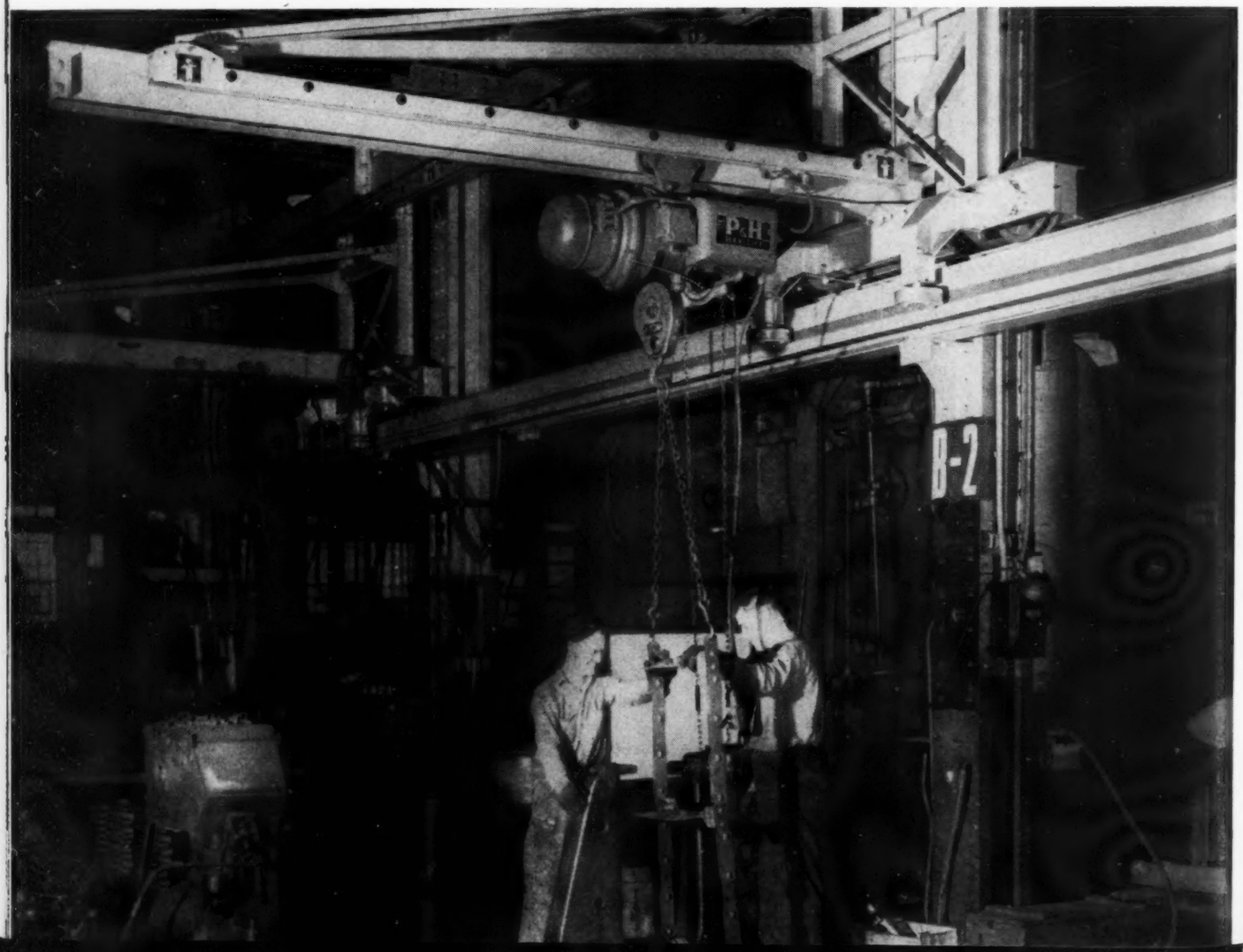
11. *Closer production control.* New shop offices for production control were provided so that each major shop has its own production control office and planning board.

12. *Abrasive dust eliminated.* In two machine shops adjacent to the railroads, ventilating window sash was replaced by glass block windows, and power-driven roof ventilators were installed. The open windows were causing dust and dirt deposits on machine tools, with resultant excessive maintenance costs. This change not only eliminated the offending dust, but also gave better light and ventilation.

13. *Rust preventive process added.* Because of climatic conditions in certain seasons, machined parts used to rust overnight. A cleaning and degreasing room was therefore installed adjacent to the large production machine shop. All machined parts now pass through this department to be cleaned and treated with a rust-preventive solution before moving to the assembly department or stockroom.

14. *Clean, dry compressed air insured.* Shortage of compressed air, with resultant moisture and dirt in the air from overloads, was met by installation of a 1600-c.f.m. compressor equipped with an aftercooler and an automatic moisture separator Two old compressors were retained for standby service and light loads. The new compressor is driven by a 300-hp. synchronous mo-

TRAVELING WALL BRACKET JIB CRANE. TROLLEY DUCT POWER DISTRIBUTION SYSTEM IS USED IN PLACE OF OPEN TROLLEY WIRES



tor which keeps the power factor at 93 percent.

15. *Electrical distribution revamped.* In enlarging and rearranging the electrical distribution lines to match the new layout, the use of a copper bus system in sectional metallic duct proved most economical in concentrated areas. In areas where conduit already existed, it was found cheaper to retain it, and also to use it for single lines and non-concetrated areas.

16. *Lighting at 35 foot-candles.* Preliminary to its plant-wide installation in high-bay machining and assembly areas of 35 feet or higher, a mercury-vapor lighting system has been tested in several areas. It gives an intensity of 35 foot-candles at working level. Spacing of lamps is on 30-ft. centers in high bays, 12- to 15-ft. centers in low bays. Operating and maintenance costs were found comparatively low.

17. *Materials handling equipment for lower costs.* Materials handling was studied on a plant-wide basis, and resulted in the installation of a yard crane, 6 overhead traveling cranes, more than 50 jib cranes, numerous air and electric hoists, electric trucks, fork lift-trucks, and hand lift-trucks. Supplementary equipment included portable storage trucks for use around machine tools, pallets, skids, totepans, and barrels. Variable-speed air hoists were chosen and air-driven tools were installed. A filter and an automatic lubricator were installed in the airline before each tool to insure proper lubrication and low maintenance.

18. *Concrete machine-tool foundations.* All heavy machines and precision machines were set on concrete foundations. In the old layout, heavy machines on the second floor caused much trouble because of shifting timber, which involved a continuous chore of releveling. The building is of mill-type construction with steel main beams, timber cross-beams and joists, and wood floors above the basement.

In the new layout, most of the heavy machines were transferred to the ground floor, where provision of suitable concrete foundations was not a problem. In cases where any such machine had to be located above the basement level for good layout, a special reinforced concrete foundation was constructed. This foundation was suspended in the floor by pouring a concrete slab into a floor opening prepared by removal of timber beams and joists, and by installation of steel I-beams and cross-beams to form the supporting sides of the slab. The bottom of the slab was formed over a ¼- or ⅜-in. flat or arched steel plate, while the top was made exactly level with the wood floor. Frequently, steel H-columns had to be added for adequate beam support. Then, before setting any machine in place on its foundation, screw-type leveling blocks were installed and leveled by use of a surveyor's level. This cut machine installation time, and will simplify all future leveling and other maintenance.

19. *Working conditions improved.* For better working conditions, ventilation in all shops was improved by installation of power-driven roof ventilators. The shop planning headquarters was air conditioned, and a smaller shop office air cooled. Plant heating was improved by the installation of thermostatically controlled unit heaters in cold areas. New water-wash paint spray booths in shipping areas reduced paint fumes and fire hazards. A modern locker room was built for maintenance employees, and another locker room was enlarged. All working conditions were checked by the safety director. Dust removal systems, guards, shields, chains, and signs were installed wherever required.

20. *Painting program defined.* Beginning with the painting of the new buildings and additions and the new machines, a painting program was begun for improvement of light conditions and plant morale that will eventually cover the entire plant area. A color scheme was adopted for the buildings. Ceilings are white, and sidewalls are white down to the light reflection line. From that point sidewalls are pale green down to the dado line, and dark blue-green from the dado line to the floor. For machines, a two-tone color scheme was decided upon, using light buff on moving parts and background surfaces that needed to be highlighted, and machine-tool gray elsewhere. Because manufacturers customarily furnish racks and bins in cabinet green, this color was adopted for that type of equipment.

These and many other physical changes constituted the consummation of the second stage of the modernization program. Nothing was overlooked that in any way could cut production costs. More than 9 months were required to complete all the major projects and to set in motion the long-range plans, such as high-bay lighting and painting.

Given now the improved facilities, better production equipment, better layout, and better working conditions, it was possible to proceed with the third and final stage of modernization, that of improvement of production methods. In many cases existing products were completely re-tooled for each operation. Synthetic time studies were made to compare the cost of existing and proposed methods. Fixtures were designed for ease of loading and unloading and accuracy of the finished part.

INSPECTION IMPROVED

Inspection standards were carefully checked, and in many cases closer tolerances were set up. A new tag system was introduced for handling reclaimable or scrap work to effect better control.

With the provision of production control offices for each shop whose activities were governed from a central planning room, revisions were made in control methods. Operation cards are now placed on the planning boards (by machine number) only when the job is ready to go. All other cards are held on file in separate groups for each operation, awaiting release by the planning department. Progress of each individual order is recorded in a master production-control book. At daily meetings all planning activities of the entire plant are coordinated.

Still yet to be completed, but also considered essential to the full attainment of the over-all objectives, is that part of the program dealing with the wage-incentive system. Naturally, in major changes such as were undertaken at this plant, complete re-evaluation in time studies was required where changes were made. But first, methods, tooling, materials handling equipment, and working conditions have to be perfected or checked. This takes time. In some cases, motion studies are desirable beforehand. After time studies have been made, standards can be set up, and incentive rates determined.

Despite the understandable inability to cite specific benefits from this threefold modernization program, enough evidence is already at hand to convince management that the approach and analysis have been sound, and that if results continue to run true to form, all objectives will have been met beyond expectations.

ON-THE-JOB TRAINING FOR GRADUATE ENGINEERS

RICHARD G. GREINER • MANAGER, TRAINING DEPARTMENT, ALLIS-CHALMERS MANUFACTURING CO., MILWAUKEE

In a company embracing ten engineering departments and producing more than 1600 products, the problem of continually fitting the right man to the right job is not a simple one.

Recognizing this fact, Allis-Chalmers Manufacturing Company has for more than 45 years conducted a two-year training course for graduate engineers.

Each year about 90 graduates, selected by company representatives from universities all over the country, come to Allis-Chalmers to undergo two years of shop, office, and classroom work before they are permanently assigned.

The graduate engineer is allowed great flexibility in laying out his training course. His experience, aptitudes, preferences are first discussed with expert training department advisers. Together they project a schedule that includes a related sequence of jobs all pointing toward a general objective. The trainee-worker is then rotated through departments on assignments that will provide the best experience.

Assignments are classified in general terms of design, application, development, sales and production, and erection. Trainee thus has an opportunity to choose from a number of fields, in any of which he may specialize and yet retain proper conception of interrelated divisions.

ASSIGNMENTS VARY

Training locations vary widely. Graduates training and working on test floor assignments gain valuable experience in operation and maintenance plus a comprehensive knowledge of design and engineering on electrical equipment. steam turbines, centrifugal pumps, hydraulic turbines, blowers and compressors, electrical controls.

Trainees who work in the offices concentrate upon engineering and sales under supervision of experienced engineers in the different manufacturing and engineering departments of the company. Other types of office locations includes miscellaneous operating departments, such as purchasing, feedwater treating, industrial relations, advertising and public relations, new product development, accounting, district offices, and export sales.

ON-THE-JOB EXPERIENCE

Miscellaneous assignments in the shop give graduate engineers practical lessons in production procedures and experimental research, including time study, production control, power plant, high voltage laboratory, switchgear laboratory, tank and plate shop, forge shop, foundry, research laboratories, and erection and production work in the different shops and branch works.

Before his training course is completed, the graduate engineer selects the department that interests him most, and is temporarily assigned to it. If he and the department head agree that the department best fits his training, he is placed there permanently. A diploma is awarded each engineer upon completion of the course.

SCIENCE DEGREES EARNED

Classroom instruction is provided to supplement and correlate practical experience. Company products and policies, applied business psychology, and advanced theory in all pertinent subjects are taught in classes, held half a day each week. A different conference leader, lecturer, or instructor conducts classes during each 50-min. class period.

Many foreign students are enrolled for graduate training. Some are being trained as company representatives; others are gaining industrial experience needed by their native countries. Currently there are 36 foreign students at

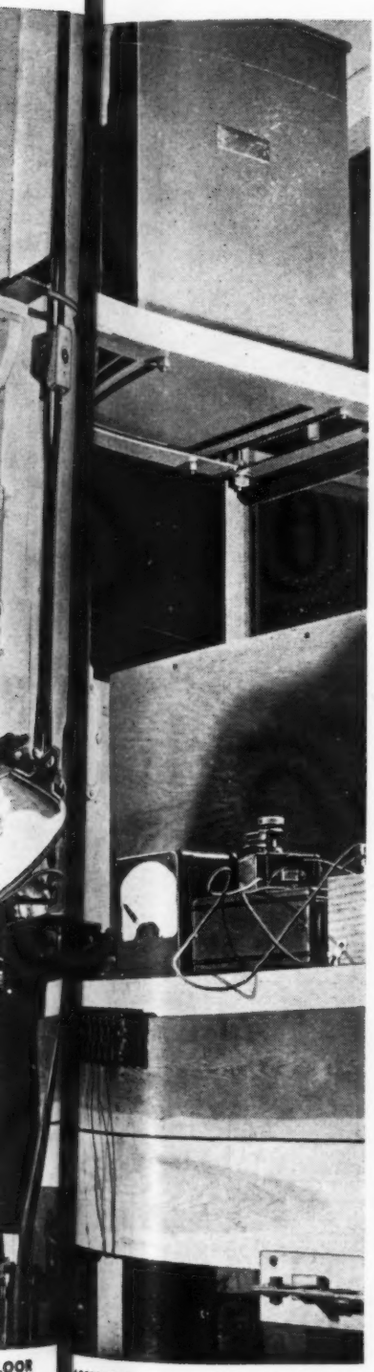
THIS ENGINEER HAS CHOSEN TEST FLOOR

the school, and 16 different countries are represented.

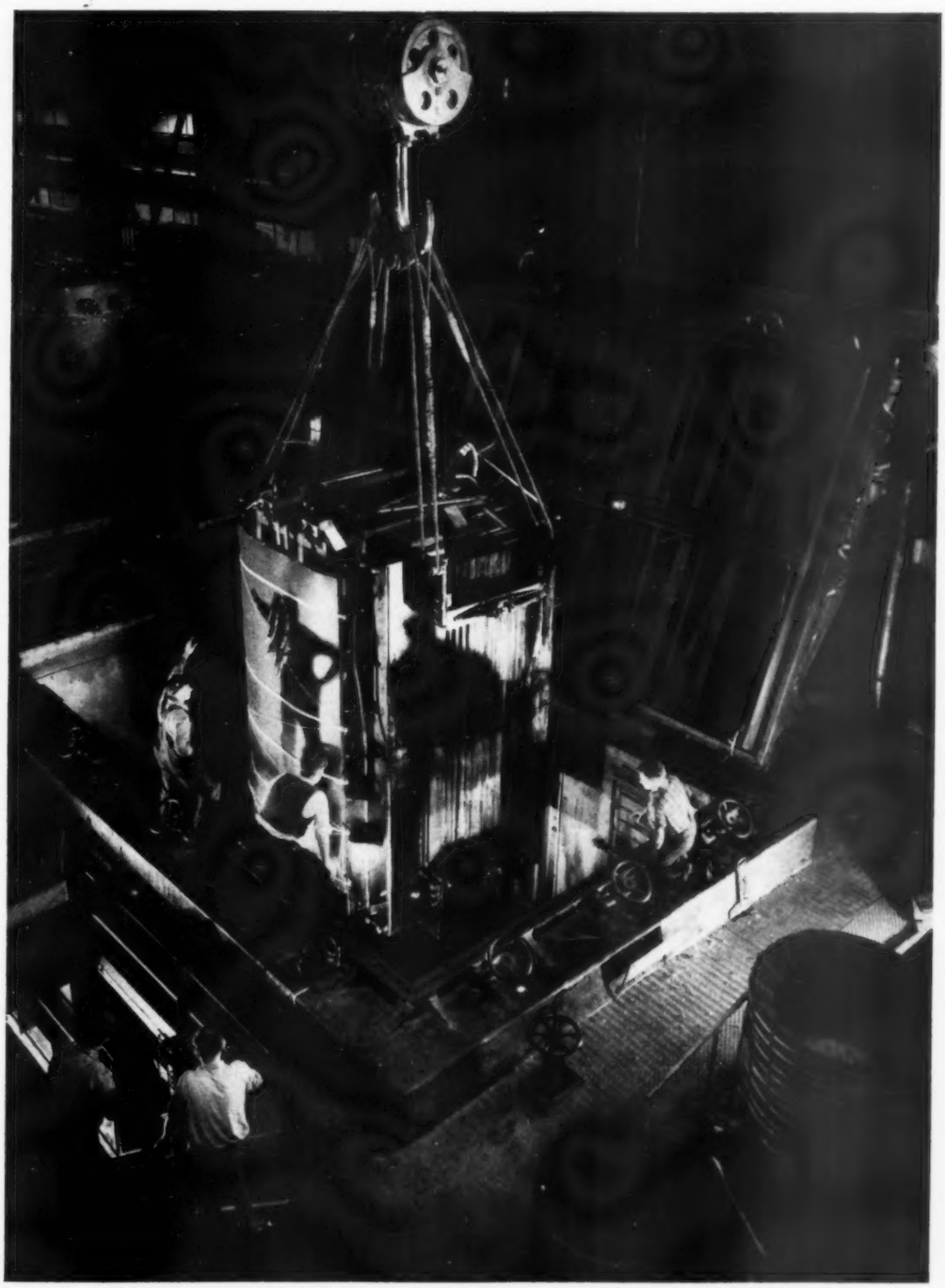
All enrollees automatically become members of the Aces Club. This organization promotes social activities and builds cooperation among personnel. Important lectures, athletics, tours of neighboring plants, and many other functions are handled by the club.

As a further incentive to employees who desire to add to their formal education, a program of graduate training courses leading to a master of science degree in electrical or mechanical engineering was started in the fall of 1944 in cooperation with the Illinois Institute of Technology. Classes are taught in the plant by Illinois Institute professors, who commute to the company. The company carries two-thirds of the cost of these courses; cost to the student, on completion, is one-third.

Of the college graduates who have been selected from the training course since 1925, approximately one-third have joined the company's district sales offices, another third have remained in the main office in various engineering capacities. The others have gone on the road for the erection department or are taking part in main works management and in the management of one of the company's many branch works.



ASSIGNMENTS AS HIS FIELD STUDY



GRADUATE ENGINEERS IN A PHASE OF TRAINING THAT PROVIDES ACTUAL SHOP EXPERIENCE

operating shorts

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary operating accomplishments. Accepted articles will be paid for

Inspecting strips for engine bearings. Steel trough turns strips after first inspection so that second inspector sees opposite side of blank

STEEL TROUGH SIMPLIFIES INSPECTION

D. G. COCHRAN, Plant Engineer, Moraine Products Division, General Motors Corp., Dayton

A simple sheet-metal trough has been designed to turn engine bearing blanks automatically so that the surface on both sides may be inspected without the necessity for handling each piece separately. The job is much less tiring and personnel required has been reduced from three to two inspectors per shift.

The bearing blanks which are cut to size in the blanking press must be inspected for pre-marked defects and scratches. Before this simplified procedure was adopted the inspection was made by turning each blank by hand, a much slower and more tiring procedure.

USING CONCRETE TO REPAIR CAST-IRON PUMP

JAMES W. KAYE, Chief Engineer, Plant Service Division, Thomas A. Edison, Inc., West Orange, N. J.

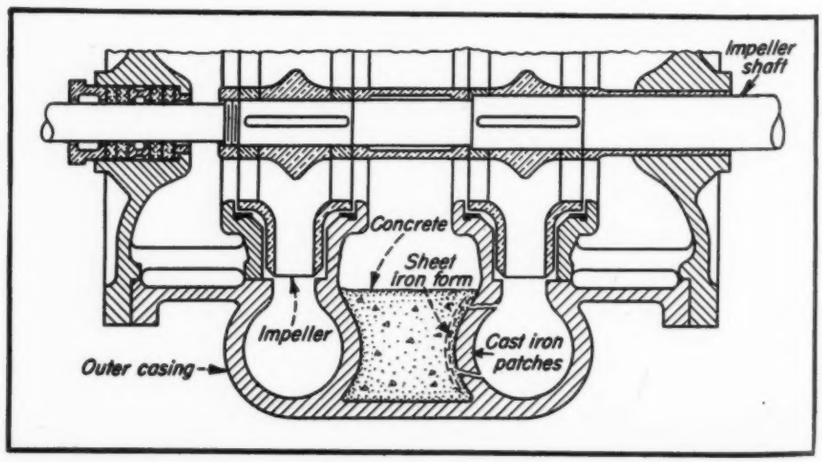
When the vacuum on a 2500-kva. turbine supplying plant power dropped to 20 inches, it was discovered that the circulating water pressure was about half what it should be, and that something was radically wrong with the circulating pump. The turbine was continued in operation at this low vacuum until the reduced load could be taken by an old-type turbine kept for just such an emergency.

The defective circulating pump was quickly dismantled, and revealed that the casing wall of one discharge area had blown large holes. This pump is a single-stage two-impeller pump of 3000-g.p.m. capacity. The suction and discharge is divided into equal areas by cast-iron division walls which distribute the water equally from each impeller opening, giving the equivalent of two separate pumps in one casing.

After scouting around, a piece of cast iron that fit the holes was found, and plans were made to electric weld the piece to the pump casing. At the start it looked like just an ordinary welding job, but after cleaning the casing for the weld it was seen that the cast iron had disintegrated to the degree that it was soft like graphite and could be cut with a knife.

The welder was doubtful whether he could make a successful weld, but he did the job to the best of his ability, and it looked like a good job. However, after starting up the turbine, the pressure dropped within a few minutes. By this time it was in the small hours of the morning. Actually the prospects for repair looked hopeless, and conditions seemed to justify the advice of the pump manufacturer's representative who had been called in, to discard the pump. But because it was imperative to get this pump in operation, a further discussion of the problem led to the idea of using concrete to make at least a temporary repair. How this was done is shown in the sketch of the cross-section of the lower half of the pump.

First, patches of cast iron were fitted in the blown holes which extended almost halfway around the casing of the bottom of the pump. These patches were electric spot-welded, and the cast iron was cleaned thoroughly. Then, a crude form of sheet iron was built and secured in place with wooden wedges. There was plenty of room to do this without seriously interfering with the flow of water. Finally, a very rich concrete was prepared, containing a waterproof hardening compound, and poured into the form. After letting the concrete harden for 6 hours, the pump was put into operation. It operated satisfactorily for four months, which gave plenty of time to arrange to replace the patched casing with a new one.

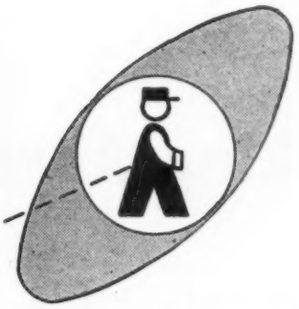


FIRE PROTECTION ON ALL THREE SHIFTS

Prompt and efficient handling of any fires that may occur in the plant of The Formica Insulation Company, Cincinnati, is assured by volunteer fire brigades, one for each of the three shifts, always on call.

Each brigade consists of eleven members —nine regular firemen, an assistant chief,

Looking Ahead in Labor



last-minute round-up as we go to press . . .

Labor leaders know the first round of post-war wage increases broke the back of OPA. Despite CIO forecasts, experience proved that wage increases without increased production must bring higher prices.

Organized labor is therefore inclined to move cautiously in the present climate of ticklish prices. Second-round wage demands will not be formalized until smoke of OPA battle clears, perhaps not until the AFL convention in October and the CIO meeting in November.

That's why the CIO executive board called only for a labor-management conference to formulate "adequate guarantees for a stabilized national economy." *There was no denying that, even with OPA, prices rose steadily after the February 14 appeasement of Philip Murray's steel workers. BLS statistics bore this out.*

Strategy now is to mark time, watch prices—then, when prices level off and production is rolling, seek compensating wage increases. This is intended to blame others—Congress and industry—for the higher prices and build up public support for the second-round wage demands.

Even President William Green, urging "self-discipline and restraint" by AFL members, said: "We must refrain from causing any interruption of production, because production alone can save us."

•

This does not mean we shall not have another wave of strikes next winter. Yet workers will be less inclined to "hit the bricks," particularly those in General Motors and others who walked the picket line for weeks on end last winter.

But they will strike if they feel it would be to their advantage. This time the UAW-CIO has handed the ball in the automobile industry to its Chrysler members. When another wage pattern is developed in automobiles, Chrysler will probably be the guinea pig.

Increasing reluctance on the part of the White House to win strikers their demands by seizure of plants will discourage some strike thinking even before it is generated. The risk of losing a strike will again play an important part at the bargaining table. Seizures will be few and far between.

Considerable emphasis in new wage demands will be on stability of employment and machinery to preserve, if possible, real wages. The guaranteed annual wage is one medium of achieving the first. It is being talked of by the automobile unions and is certain to be renewed by the steel workers, who first raised the issue in December, 1943. The packing-house workers have a 36-hour weekly guarantee, *now want assurance of 2080 hours a year.*

Keep your eye on the guaranteed wage study sponsored by the OWMR advisory board. It has met considerable employer resistance to industry-wide studies, but the committee isn't giving up. Individual employers are now being canvassed regarding their interest in having a study made of their operations.

•

Various means will be sought to preserve the buying power of the hourly wage. One is an open-end contract which can be reopened at any time, at least as to wages. This is what John L. Lewis got for his United Mine Workers in the anthracite agreement. Wages can be discussed at any time on 10 days' notice. Another is the old escalator clause, ineffective during wartime wage controls, which ties wages to the cost of living.

The new contract at Publicker Commercial Alcohol Company, Philadelphia, allows an adjustment—up or down—when the BLS cost-of-living index fluctuates 3 percent. A third device is the cost-of-living bonus, such as is being asked of the Big Four meatpackers.

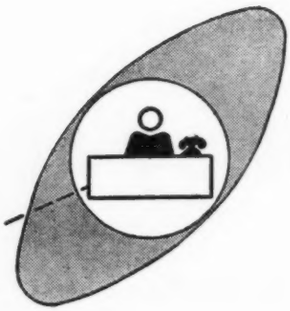
Hot CIO-AFL rivalry has yet to materialize in the south. CIO claims to have won 36 out of 40 NLRB elections; between 8000 and 10,000 new members. It has some 300 organizers roaming the twelve southern states. Textiles and lumber are primary objectives. Chemicals, oil refining, and food processing are secondary.

Direction of CIO-PAC by a board of CIO vice-presidents and Jack Kroll, an unknown nationally, is bound to reduce its effectiveness. *Only Murray himself could have given the CIO political machine the zip it demonstrated under the late Sidney Hillman. For reasons of his own Murray chose not to assume the political leadership at this time. There will be a re-appraisal of the situation after the elections; more talk of a labor party.*

•

That brings us to the CIO convention at Atlantic City on November 18. It is there that the CIO was born 10 years ago. There, too, Murray replaced Lewis as CIO president in 1940. Will Atlantic City's boardwalk again provide the backdrop for another history-making CIO drama?

Looking Ahead in Business



last-minute round-up as we go to press . . .

The next few months will see a flow of finished goods never equaled in peacetime. Nevertheless, industrial production will hit a ceiling fixed by lack of manpower when it rises 10 percent or so above mid-July levels. Thus the boom will keep going. There are no signs that supply can catch up with demand for quite a while.

Industrial activity will be close to practical capacity by mid-August. Production of non-durables (textiles, foods, petroleum, chemicals, etc.) topped the 1941 rate by 18 percent as early as March and can't rise much more. Production of durable goods (autos, steel, machinery, etc.) lagged 15 percent behind 1941 in the first half, but should be close to or slightly above 1941 by mid-August.

Despite the fact that industrial production is close to a fixed ceiling, the flow of finished goods will swell rapidly. Most of industrial activity in the first six months of reconversion was spent building up inventories of raw materials and in-process parts to get assembly lines rolling. Then strikes held up assembly lines, but factories went on buying materials and making parts.

Now, however, factories are beginning to turn out finished goods in volume. This means that the flow of finished durable goods should soar 50-60 percent above the first-half level by year's end even though activity in durable lines can rise only a third.

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The fact that inventories of raw materials and in-process parts are close to normal levels doesn't mean an inventory collapse like the one in 1920. Inventories of finished goods in the hands of manufacturers, wholesalers, and retailers are about $7 billion below their normal relation to sales. And inventories of raw materials and in-process parts are still a billion or so below normal.

Because of the tremendous demand for finished goods, business will be hard-pressed to add more than $2 billions to inventories in the second half of the year. Meanwhile, CPA inventory controls will deliberately hold inventories below normal.

Result is that the demand for goods to build up inventories won't slacken for a long time.

We have already reached the 60,000,000-job full employment goal set by Henry Wallace. In June 56,700,000 persons held civilian jobs; another 3,000,000 were in the armed services; by now the total is over 60,000,000. Unemployment is still around 2,500,000, close to the minimum practicable in peacetime.

Moreover, manufacturers seeking factory workers will face increased competition from construction firms. To meet the veterans' housing program, a million additional construction workers will be needed in the next year.

•

Construction continues to boom. Activity in June topped $900 million, an annual rate higher than the 1941 total. And the curve is rising.

But part of the increase represents higher costs, not higher volume. *Engineering News-Record's* construction cost index has risen 15 percent in the past year. What's more, the veterans' housing program is in for a lot of tough sledding. Output of a number of important building materials is not yet up to plan; construction of prefabricated houses has lagged 90 percent behind schedule; costs are still rising.

All in all, it looks as though it will be some little time before the government ban on non-housing construction will be relaxed a whole lot.

The export boom is picking up speed. *Exports in May hit a new peacetime high. Manufactured goods make up about half of current exports; machinery accounts for about a third of total foreign shipments of manufactured goods.* **Approval of the British loan, on top of other foreign loans, will give exports of manufactured goods, particularly of machinery, a powerful shot in the arm.**

Despite talk of a buyers' strike, demand shows no signs of slackening. Consumers are spending more than ever before; department store sales are running about a third ahead of last year. Business purchases of capital equipment reached a $9½ billion annual rate in the second quarter. And the government is still spending more than it is taking in.

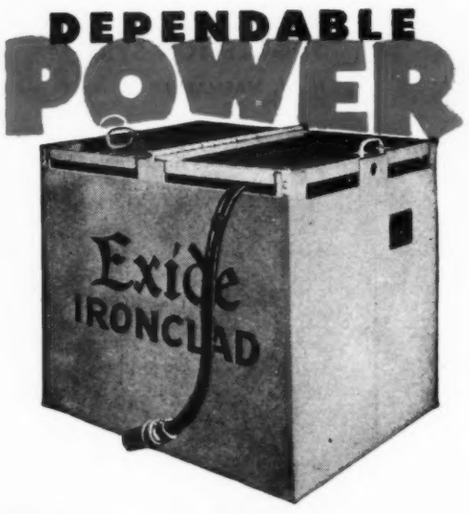
Everything points to a high, wide, and handsome boom with full employment, high production, and rising prices. Runaway inflation can be avoided. But the big, and as yet unanswerable, questions are: How long will the boom last? Will it be followed by a "bust"?

TRUCKS KEEP WORKING STEADILY, ALL DAY LONG, WHEN OPERATED WITH EXIDE-IRONCLAD POWER

You can count on full shift availability—day after day—when the battery power is supplied by Exide-Ironclads. They have the *high power ability* that frequent "stop and go" service demands . . . the *high maintained voltage* that heavy handling requires . . . and the *high capacity* that eliminates end-of-day slow-downs.

For greater efficiency and economy . . . for increased tonnage and lower costs . . . delegate your materials handling to trustworthy electric industrial trucks and Exide-Ironclad power. It's the combination that assures dependable performance, long-life, minimum maintenance and maximum safety.

Write us for a FREE copy of Exide-Ironclad TOPICS which contains "Case Studies" of materials handling problems. Tells how to cut handling costs up to 50% . . . covers latest developments in handling materials from receiving to shipping.



THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 32
Exide Batteries of Canada, Limited, Toronto

and a captain. They work closely under the supervision of the safety director.

This group of employees has been thoroughly trained not only to put out fires, but to prevent them. Through a special course sponsored by the Cincinnati fire department, they see movies on the subjects of plant protection and fire prevention, and are shown special pointers on the practical techniques of fire fighting.

Here's how the fire brigades operate:

1. Fire is discovered and reported by employee.
2. Interfactory fire signal is sounded, designating location of fire.
3. Elevators are immediately brought to main floor, so that emergency fire truck can be taken to the area.
4. Fire brigade members immediately drop their work and proceed to the fire.
5. Two brigade members pull emergency truck to the area involved.
6. Safety director or officer in charge checks the conditions, and, if the fire looks serious enough to need outside help, calls the city fire department.

SMALL JIB CRANE HANDLES LATHE FACEPLATE

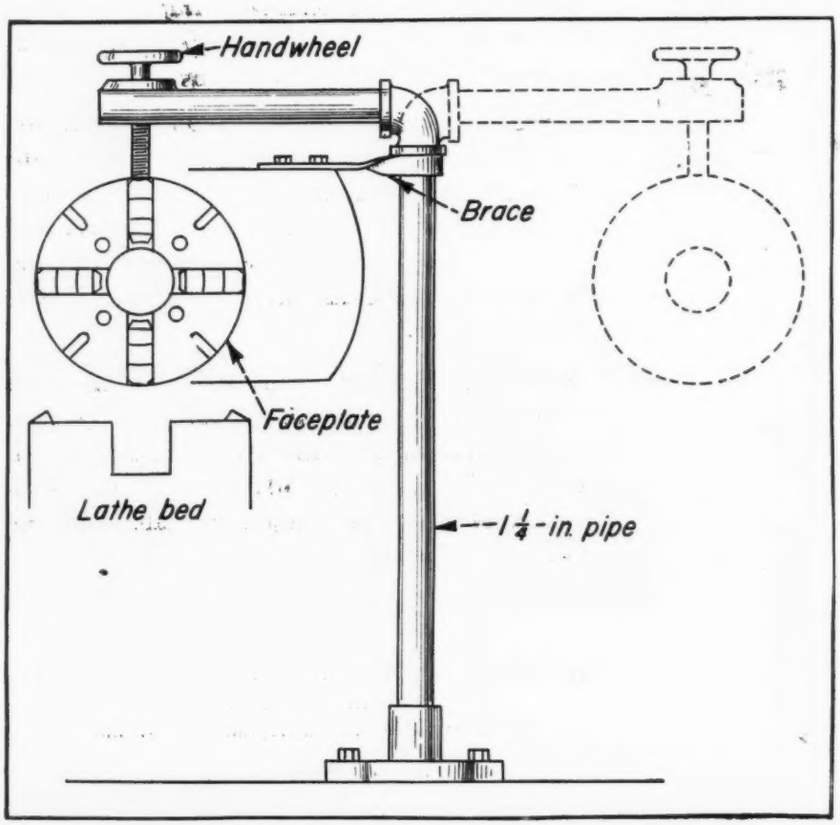
GILBERT LINDGREN, Electrical Maintenance Foreman, Troy Coke Plant, New York Power & Light Corporation, Troy, N. Y.

The small jib crane shown in the illustration saves a good deal of time in removing or replacing a faceplate on one of the lathes in the machine shop. This lathe handles a considerable variety of work. The faceplate is much too heavy to be handled by hand. Since the shop crane is not always available just when wanted, considerable time formerly was wasted in waiting for it, when it was necessary to put the faceplate on or take it off.

The crane was made of scrap 1¼-in. pipe and fittings. It is bolted to the floor and is braced by a piece of strap iron that encircles the pipe at the top and is bolted to the gear box on the lathe.

The handwheel was taken from an old 6-in. valve. A new stem was fitted in it that screws into the eyebolt hole in the faceplate.

When the faceplate has been removed it is pushed back out of the way and left there, supported by the crane, until it is needed again.

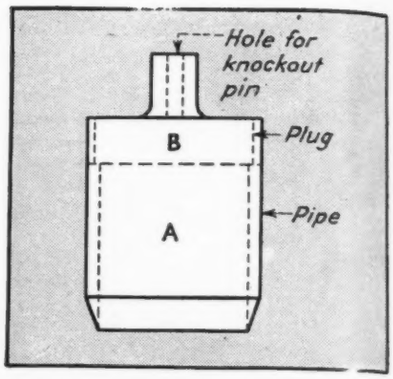


SIMPLE CUTTER FOR DISK GASKETS

ROBERT S. ALEXANDER, Newport, R. I.

In the maintenance of hydrostatic testing equipment there is occasional use for a number of 1½-in. disks cut from sheet asbestos gasket material. The quantity did not warrant making a punch and die, but it was desired to get away from laying out the disks with dividers and cutting them out by hand, which was the original method. Accordingly, the cutter shown in the sketch was made up, using a piece of scrap pipe for the cutter body and salvaged cold-rolled stock for the plug.

Referring to the sketch, the cutter body,



A, is chamfered to a 60-deg. cutting angle at one end. The other end is bored to receive the plug *B*, which is a force fit. A 9/16-in. hole was provided in the center of the stud for a knockout pin, in the event that a disk rides up the inside of the tool, as sometimes happens when the cutting edge becomes dull.

In operation, the tool is held in the drillpress chuck and the asbestos sheeting material is laid on a board placed on the table. With the drillpress running at high speed, it is a simple matter to cut out any number of disks from ⅛- and 3/16-in. material.

DAILY RECORD SERVES AS MAINTENANCE REMINDER

JOHN BURCHFIELD, Maintenance Engineer, Iron Fireman Manufacturing Company, Cleveland

To serve as a constant reminder of repetitive maintenance jobs, a three-ring loose-leaf binder has been developed, in which a page is inserted for each day of the year, month by month.

On these pages is entered the information required to remind the maintenance department when regularly occurring work must be done, and the details involved. Each morning the page for the day is checked, thus keeping the regular maintenance schedule constantly up to date.

COLORED FORMS SPEED SUGGESTION SYSTEM

H. C. MARMADUKE, Illinois Central Railroad, Chicago

To speed the working of its employee suggestion system, the Illinois Central Railroad has adopted a different colored form to be used by each of its 14 division, shop, and terminal suggestion committees. These easily identifiable key colors insure that suggestions are quickly referred to the committee in the employee's home division. In the suggestion system's main office in Chicago, where all suggestions are sent after being handled by the local committees, the possibility of error in filing is materially reduced.

Employees in train service whose runs take them from one division to another have a better opportunity to learn of the disposition of their ideas by using blanks

Rollers
REDUCE
FRICTION
AS THEY
Roll!
More than half a century ago, Hyatt created the first anti-friction bearing designed to carry the load the full length of a roller.
So revolutionary and successful was this principle in performance that, over the years, many additional types of Hyatt Roller Bearings have been built to meet the progressive requirements of speed, load carrying capacity and ease of assembly.
Today, with a Hyatt Roller Bearing for every application—proved in every field—Hyatts are always your assurance of a better buy in bearings. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.
HYATT
ROLLER
BEARINGS

of a color which will automatically be returned to their home divisions. Delay in locating an employee when a blank is sent to the wrong division is eliminated.

These improvements serve the dual purpose of making it easier for employees to submit suggestions through the proper channels, by providing understandable instructions, and of speeding the disposition of those suggestions by more effective handling.

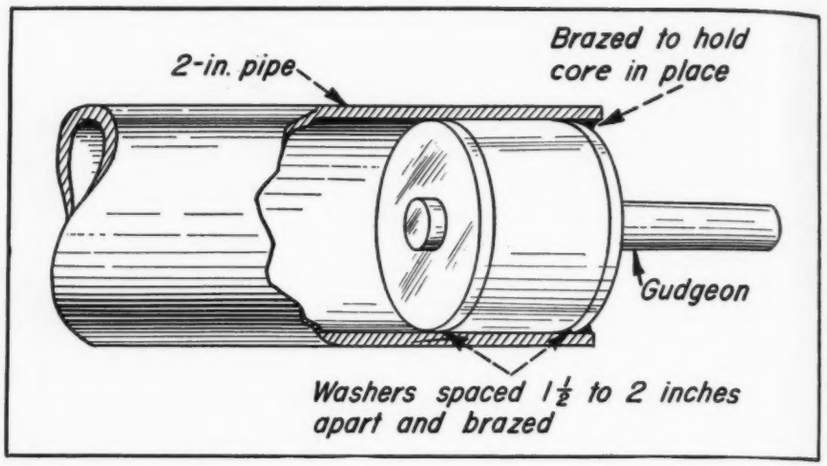
ROLLERS MADE FROM STEEL PIPE

H. E. WENRICH, Berwick, Pa.

We were in urgent need of light steel rollers approximately 2 inches in diameter, and there was no source of supply. One of the men thereupon devised the ingenious roller shown in the sketch, making it from ordinary steel pipe.

Because the rollers could be turned down without regard to close tolerance, cutting the outer rough surface to a smooth finish on a lathe was no problem. But fashioning the gudgeon ends turned out to be more difficult.

The gudgeon ends were made from a length of case-hardened rod. Two large steel washers were placed on each gudgeon, as shown in the sketch, and tacked by brazing to hold them firmly in position. The washers were then turned down to a close fit in the pipe. After the washers were cut to size, they were brazed together to form a more solid unit, which was again turned down to the proper diameter. The gudgeon end was now forced into the pipe under pressure, allowing $\frac{1}{8}$-in. space from the end of the pipe to be filled by brazing. This done, the end was trued and polished.



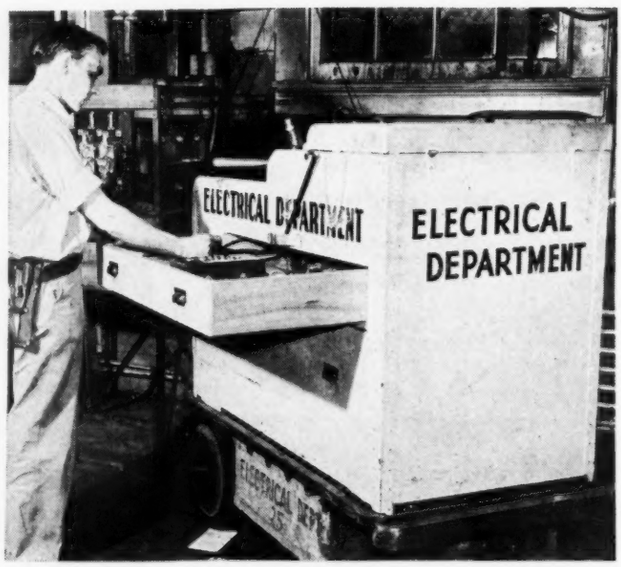
After the end gudgeon was finished, the outer surface of the completed roller was given a fine cut on the lathe and polished smooth. The gudgeons fashioned in this way produced a true-running, lightweight roller, which would have cost at least $20 —if it had been possible to purchase one.

The estimated total cost of time and material for the home-made rollers was $6.80 each.

KEEPING TRACK OF MAINTENANCE WORK

E. V. LEWIS, Assistant Plant Engineer, American Optical Company, Southbridge, Mass.

Maintenance jobs done by outside contractors could not be followed up by the regular system, so the engineering assistants started a routine of daily reports to the plant engineer, giving pertinent information about anything that might be bumped into. Informal progress reports of the various jobs are given, details of construction, agreements with contractors, changes, and ideas. The last two items were so helpful that the reports have now been expanded to cover all maintenance work. Any change in the method of doing work that might be used in another department is jotted down. It has come in handy in making studies and keeping records of repetitious repairs (such as toilet repairs, plugged drains, burned-out bearings, etc.). From this record many trouble calls have been eliminated by changes in design. Latest developments from contacts made with the manufacturing supervision are noted on the report. Complaints received are also noted, and those that become persistent are investigated.



Two power trucks specially equipped for repair work, have been found to add a great deal to the efficiency of the maintenance at The National Cash Register Company, Dayton. One (left) has been fitted out for electrical repairs, with fuses, switches, lamps, test meters, and repair parts to handle all maintenance work on lighting and circuit trouble shooting. Another (right) carries materials for belt repairs, a belt-lacing machine, rolls of various widths of belts, and miscellaneous lacing parts and tools. When a job has been completed, the repairman, who operates his own truck, calls in to a routing clerk and is given his next assignment. In this way a great deal of travel time can be eliminated, and emergency jobs can be taken care of immediately

For ease of bending, welding... and for long service —

USE J&L STANDARD PIPE

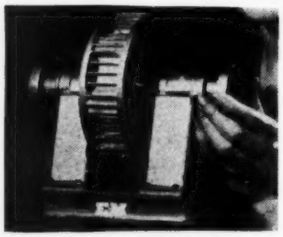
J&L steel pipe is made of J&L Controlled Quality steel especially for bending and welding in power plant installations. The long experience and skill of J&L men enables you to obtain a pipe that has uniform wall thickness, is clean and straight for your most exacting installations. J&L steel pipe is made to give long and satisfactory service. Write for information.

JONES & LAUGHLIN STEEL CORPORATION

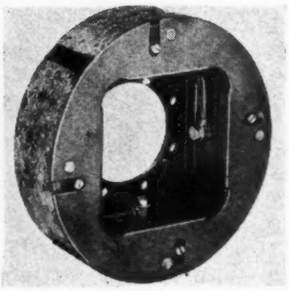
PITTSBURGH 30, PENNSYLVANIA

mechanical power transmission equipment

Mechanical power transmission equipment, including bearings, lubricants, and lubricating devices, introduced to you during the past 12 months in the department, What's New in Equipment, is reviewed here to give you a quick one-year summary

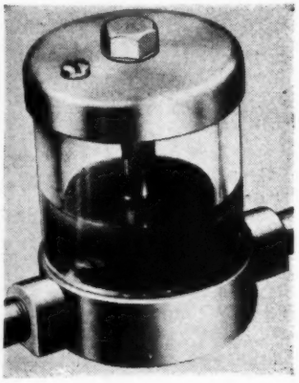


ADJUSTABLE SPEED DRIVE—Consisting of two operating parts, a rotating ring and a rotating magnet, drive is a compact self-contained electromagnetic torque transmitter used with a constant speed a.c. motor and an electronic controller, to provide split-revolution speed control. It provides power savings by operating boiler draft fans at reduced speed, for partial fan output, eliminating damper or inlet vane control. Electric Machinery Mfg. Company, Minneapolis.



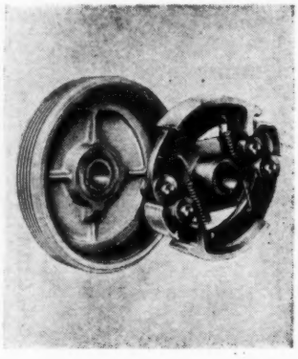
BRAKE—operating on ordinary factory airline pressures, is claimed to exert as much braking effort as brakes using ten times this pressure. Mechanism may be used either to stop or retard industrial equipment, or to provide a constant tension or braking effort. The four multi-stage diaphragms that actuate the shoes are interconnected. Linderman Devices, Inc., Newburgh, N. Y.

AIR TOOL LUBRICATOR—Automatic lubrication of pneumatic equipment is provided by lubricator, which has a full-view non-breakable transparent plastic window with "O" rings for top and bottom seals. Lubricant is regulated by a needle valve located on the air outlet side, which is adjustable to meet equipment requirements. Valve can be turned off when no lubrication is required. CCA Products Engineering, Glendale, Calif.

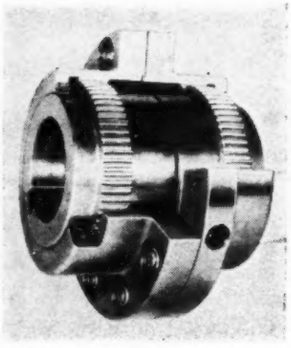


BRAKE BLOCK—Type R-M Key-Lok brake block features lateral fishtail metal strips, or keepers, in which bolts are inserted, spaced to fit in the brake bands. Keepers slide into fishtail slots cut into the block. By this means the bolts, bands, or shoes need not be removed for relining. Unit is said to eliminate deposits of foreign matter in bolt holes, and increase areas of friction surface. Raybestos-Manhattan Inc., Passaic, N. J.

LUBRICATING COMPOUND—Chemicals and oils make up 5-way lubricating compound that acts as penetrant, rust inhibitor, polish, cutting oil, and light, medium, or heavy lubricant. Treats washers, mixers, fans; prevents rust on tools; eliminates stripping and breaking; dissolves gummy oils and grease; lubricates tools and machinery; and provides protection against salt or other water. Slipit Products, Inc., New York.



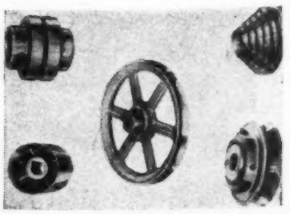
AUTOMATIC CLUTCH—can be installed on the shaft of any engine or electric motor to eliminate the shock of starting machinery or moving equipment. Incorporates fluid drive, but permits complete disengagement while idling, and positive engagement while driving, without slippage. Dual-spring balanced, it gives degree of tension required for individual applications. Salsbury Motors, Inc., Los Angeles.



COUPLING—Series A coupling has been designed for a larger maximum bore, to permit the use of smaller-sized couplings. Identical externally geared hubs key to shafts, and are enclosed by one-piece male and female sleeves which function as a single rigid unit. Coupling is said to compensate for misalignment without increasing stress on shaft or bearings. John Waldron Corporation, New Brunswick, N. J.

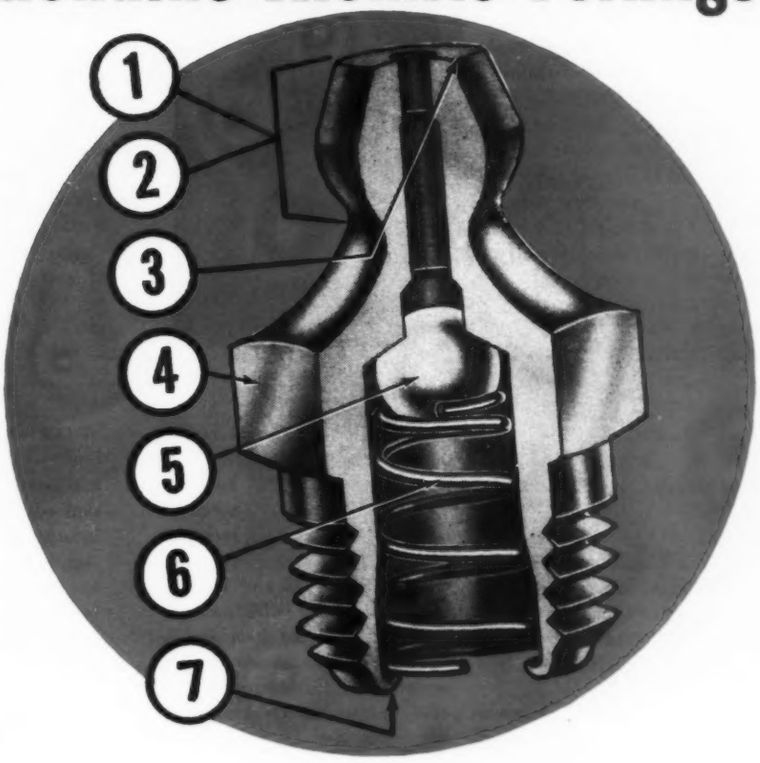
BOTTLE OILER — automatic, for light- or medium-bodied oils, suitable for use on plain sleeve bearings, line shaft bearings, jack shafts, and spindles, lubricates only when shaft is turning. Constructed of brass and transparent, heavy-walled, unbreakable lucite. Bottom shank can be permanently attached to bearings by pipe-thread connections. Air-tight filler cap permits replenishing oil without removing unit. Glass reservoirs are available for temperatures over 150 deg. F. Oil-Rite Corporation, Milwaukee.

DRIVES—Line of drives includes V-groove, step cone, variable pitch and crown face pulleys, and flexible couplings. Pulleys are up to 16-in. diameter, and flexible couplings are for applications from 1/6 to 25 horsepower. Congress Die Casting Division, Detroit.



CONTINUED ON PAGE 164

7 Reasons why Genuine Alemite Fittings are TOPS!



Some fittings *look* like Alemite fittings. But when you dissect the genuine article you can quickly spot the difference.

Alemite's latest development—the genuine Alemite Hydraulic fitting—is the finest made. It features both positive seal *and* speed. No other fitting does both. So, if it's fittings you need, specify genuine Alemite fittings.

1. **Perfected design of tip contour**—for maximum uniform seal with all types of couplers. Particularly important is the contour of the lower half of the tip, for wide angularity of coupling seal.

2. **Minute tolerance of accuracy** on the contour of the tip is controlled by precision machinery—for proper seal.

3. **Sharp Dirt-Cutting Edge** for proper seal—found only on Genuine Alemite fittings—bites through dirt and old grease instantly, making a tight metal to metal seal when coupling is applied.

4. **Case Hardened Body** for long life. High strength, heavy plated steel body will withstand 20,000 lbs. of grease pressure.

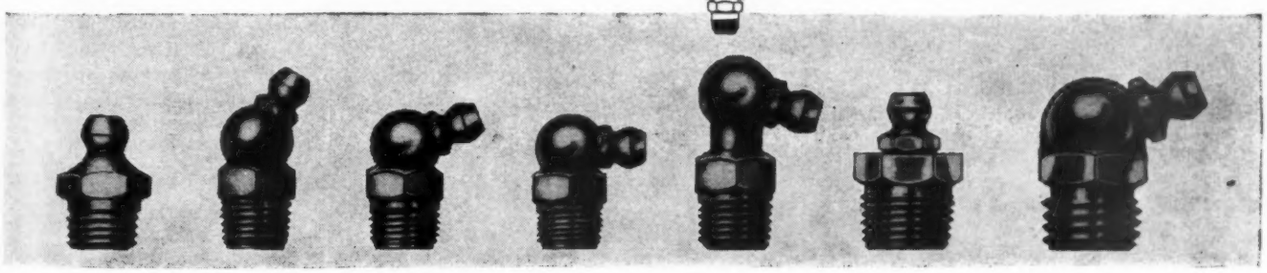
5. **A Steel Ball Check** fitted to a knife-edge seat provides a perfect lubricant seal against entrance of dirt and grit. Column of lubricant above the ball will not escape.

6. **Durable Music Wire Spring** holds ball securely for bearing protection. Cannot be collapsed—does not restrict the flow of lubricant.

7. **Full Lip Spring Lock** for spring protection. Complete curled-over lip securely retains the ball and spring—will not blow out.

EXCLUSIVE!

Alemite design of coupling and fitting allows 45° sealing angle. This permits easy servicing of hard-to-reach bearings.



1610 1611 1612 1613 1614 1627 1629

Just a few of the many Alemite Fittings of all shapes and sizes to fit every need of industry.

STEWART WARNER

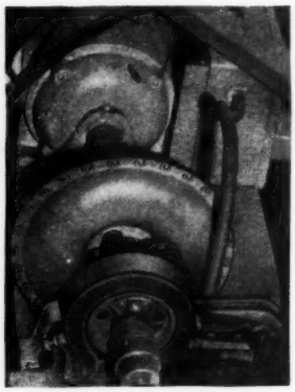
ALEMITE

Alemite ALONE Combines all 3 in Lubrication

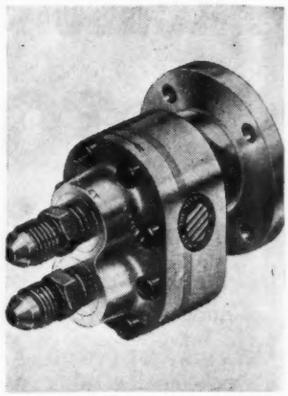
1. EQUIPMENT 2. PROCEDURES 3. LUBRICANTS

ALEMITE, 1870 DIVERSEY PARKWAY, CHICAGO 14, ILLINOIS

FLUID COUPLING—Hydraulic oil coupling is said to eliminate the necessity for both a transmission and a differential mechanism. The self-contained unit can be installed directly on the shaft. Designed for applications on cranes, refrigeration units, hoists, conveyor systems, and wherever smooth starting and stopping of power-driven equipment is necessary. Completely enclosed, preventing entrance of dust and dirt. Toolcraft Manufacturing Company, Huntington Park, Calif.



LUBRICATION PUMP—Series 1200 pump is designed for pressure lubrication of bearings of machine tools, diesel engines, turbines, generators, and other high-speed and heavy machinery. The lightweight, direct-drive gear type unit is said to operate with a volumetric efficiency of 95 percent. Three standard models displace from 0.08 to 1.5 g.p.m. at speeds ranging from 1140 to 3450 r.p.m. against pressures up to 150 p.s.i. The McIntyre Company, Newton, Mass.

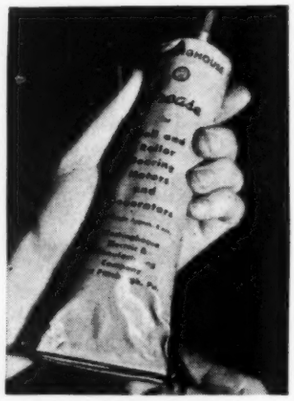


GEAR TURRETS—Connecting shafts that form any angle between 0 and 95 degrees on either side of zero angle is the function of flexible gear turret. Bevel gears attached to shafts supported in hinged housings permit shafts to oscillate and rotate simultaneously. Brooks Equipment Corp., Hoboken, N.J.

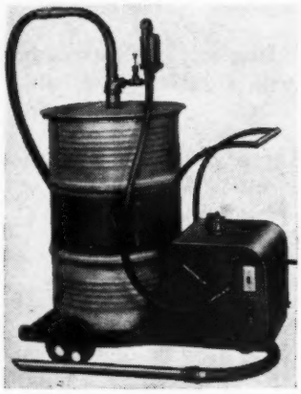
GREASES—made of Silicone are said to be characterized by a high order of heat stability, low volatility, relatively slight changes in consistency over a wide temperature range, and low freezing points. Two of the greases, DC 31 and DC 41, compounded of inorganic materials, are corona resistant and are semi-conducting. The other two, DC 33 and DC 44, are compounded with metallic soaps selected for heat stability. DC 31 and 33 are for low temperature lubrication, but also operate at elevated temperatures, and DC 41 and 44 are designed for high temperature lubrication. Dow Corning Corporation, Midland, Mich.

MITER GEARBOXES—Fabricated steel miter gearboxes and brackets for power transmission equipment are claimed to incorporate strength and resistance to shock. Extra long hubs provide for self-lubricating Oilite bearings and oil reservoir, as well as a convenient place for support of gearbox by clamp brackets. Oil-sealed and plain types are made in shaft sizes ranging from $\frac{1}{2}$ to $1\frac{1}{2}$ inches in diameter. Brooks Equipment Corporation, Hoboken, N. J.

OIL GAGES—feature unbreakable plastic sight supported by a heavy central stem and top cap, eliminating need for protective shell that might obstruct visibility. Assembly is locked with an independent nut, compressing cork gasket and preventing leakage. Gages can be taken apart for cleaning, and can be installed where there is insufficient room for a one-piece gage. Standard sizes range from $1\frac{1}{4}$ to 5 inches. Special types can be furnished. Oil-Rite Corporation, Milwaukee.



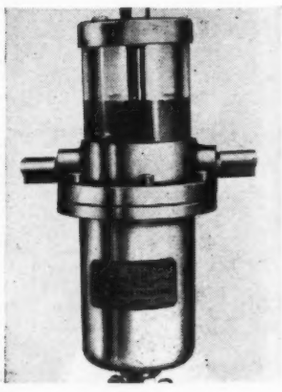
GREASE—for use on ball and roller bearing motors, is for lubrication from 13 to 176 deg. F., for all speeds up to 3600 r.p.m., and for horizontal or vertical operation. Available in 8-oz. tube, it is said to be stable, resistant to oxidation, and to remain in a bearing for an indefinite period without drying out, caking, or separating. Tube has large opening which fits $\frac{1}{8}$-in. pipe coupling, and key to wind tube from bottom. Westinghouse Electric Corporation, Pittsburgh.



OIL TRANSFER TRUCK AND SUMP CLEANER—Dispensing oil, as well as removing dirty oil, dirt, chips, sludge, and scale from sumps or tanks of machine tools, is accomplished by oil transfer truck and sump cleaner. Fitted for removable barrel—either standard open-end or closed-end drum. A second sump cleaner is a mobile self-contained unit consisting of tank, motor-driven pump, suction hose, and roller bearing wheels. Honan-Crane Corporation, Lebanon, Ind.

GREASING UNIT—Eliminating need for hand greasing operations, portable lubricating equipment is available with either battery-powered or gasoline-driven motor. Can be supplied with grease guns for different purposes. No electric cord or air hose required. Unit delivers up to 12,000 pounds consistent pressure. Provides lubrication for trucks and tractors without removing load. Pressurelube, Inc., New York.

PNEUMATIC FILTER-LUBRICATOR—Filter-Lube is a compact pneumatic filtering unit combined with a precision lubricator to service air cylinders, vises, chucks, or any reciprocating or rotary air tools. Automatic in operation, it is available in $\frac{1}{4}$-, $\frac{3}{8}$-, and $\frac{1}{2}$-in. standard pipeline sizes. Features a full-view, lightweight lubricator oil reservoir, with adjustable needle valve or regulator. CCA Products Engineering, Glendale, Calif.



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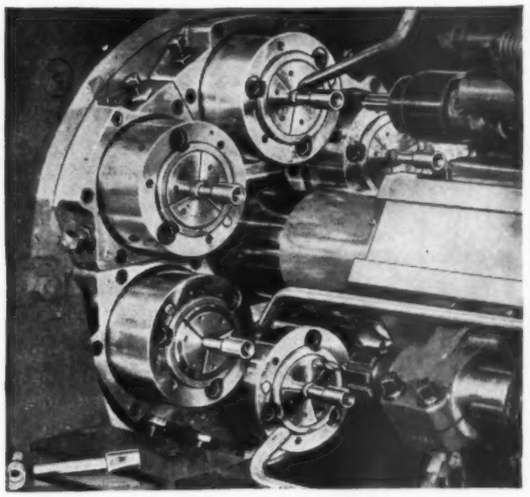
LEADERSHIP BASED ON ACCOMPLISHED FACTS

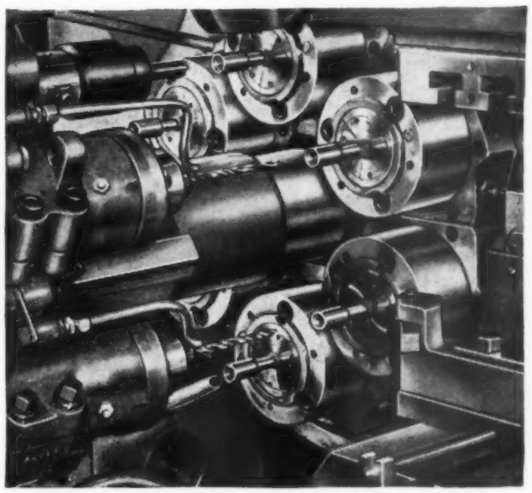


FRONT VIEW — New Britains are built to allow easy accessibility for simplified chucking, cutting tool and attachment setup.

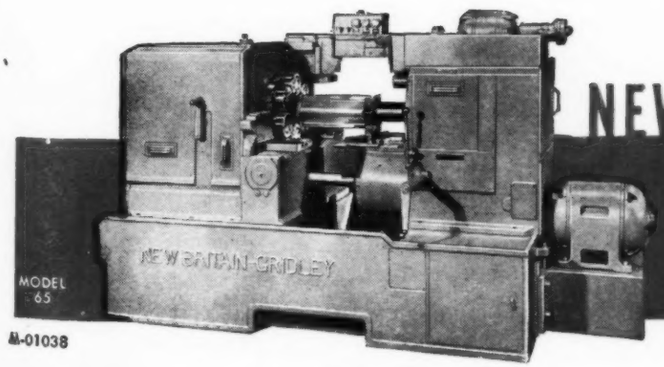
This will interest you if your work involves small accurate parts. In tooling and equipping our Model 65 Six Spindle Automatic Chucking Machines for the requirements of the Moeller Instrument Company, Richmond Hill, New York, provision was made for handling a variety of sizes of similar parts in various metals including steel, nickel copper alloy, and naval brass forgings.

The piece illustrated is a 3⅝" long tapered steel part, ¾" diameter on the large end, calling for drilling to a depth of 3½". It is held by specially designed collets, each with an extra long bearing, for drilling a deep hole leaving a thin wall. Six operations are performed at a gross production rate of 187 pieces per hour. Not a dramatically difficult assignment but a good illustration of the adaptability of New Britains to a wide range of applications . . . and another instance of high production at low cost per piece.

Many do not realize the wide range of practical applications for multiple spindle automatic screw and chucking machines. Our sales engineers *do*, and offer you a competent engineering service you may profit by investigating.



REAR VIEW — New Britain construction provides extra large chip space . . . lots of room from all sides giving excellent visibility and easy tool adjustment.

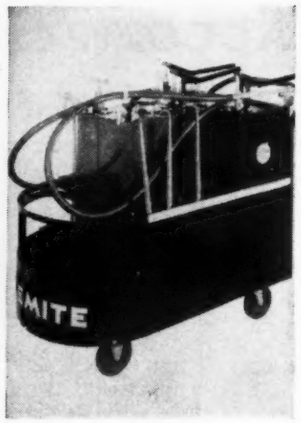


M-01038

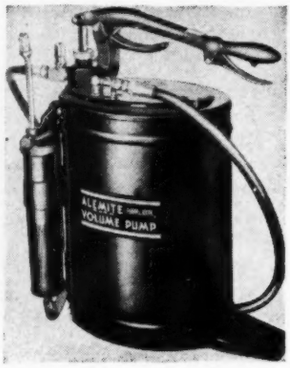
NEW BRITAIN AUTOMATICS

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
New Britain-Gridley Machine Division

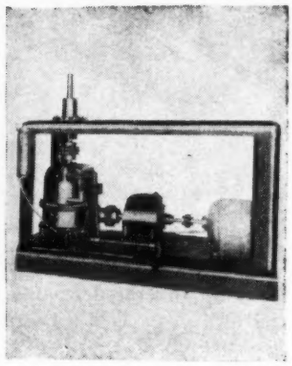
PORTABLE LUBRICATOR — Known as Lubrikart, lubricator is designed to provide complete compact, portable lubrication department, transporting and dispensing different grades or types of lubricants. Can travel between rows of machines. Basic model carries two 7-gal. tanks with low pressure pumps, one 7-gal. tank with high pressure pump, two 1¾-gal. tanks with oil transfer pumps, 6 spout-type oil cans, and 4 lever-type handguns. Alemite Division, Stewart-Warner Corporation, Chicago.



ROLLER BEARING—Operating on a self-aligning principle, spherical roller thrust bearing is claimed to compensate for shaft deflections and distortions of weaves, and to permit heavy loads to be distributed evenly over all rollers. It combines high load capacity, speed, and low temperatre. Applications include large vertical water pumps, electric generators, water turbines, extrusion machinery for plastics and rubber, gear drives, and high-speed machinery. SKF Industries, Inc., Philadelphia.

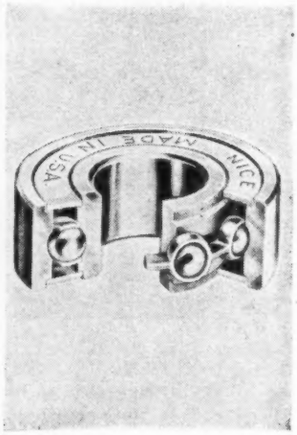


PRESSURE LUBRICATOR — Loader pump, for hand lubricating guns, and high pressure volume bucket pump have been combined to form a single, portable unit. Hydraulic hose plug prevents lubricant from escaping through grease hose when loading a hand gun. Unit is obtainable in a range of sizes, to deliver lubricant from original containers of 25-, 35-, 100-, and 400-in. capacity. Alemite Division, Stewart-Warner Corporation, Chicago.

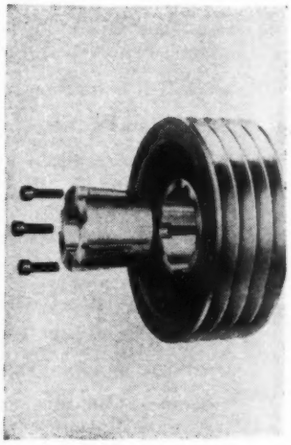


TRANSMISSION — Known as 9000 B series, transmission is adapted to flat plate or platform mounting. Unit has 5-hp. capacity with input speed of 900 r.p.m., and four gear changes are available through one shift lever, automotive type. Gears and shafts are of alloy steel, heat-treated, and gears are lapped. Revolving shafts are mounted on antifriction bearings, and case is oil sealed. Western Manufacturing Company, Detroit.

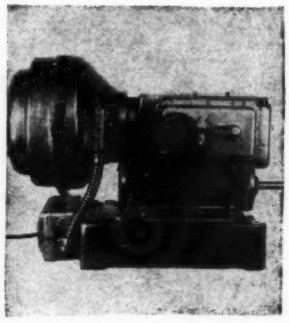
RADIAL BEARINGS—Inch-size Series 1600 radial bearings are suitable for medium loads and maximum speeds of approximately 3000 to 5000 r.p.m. Higher speeds may be obtained where smaller sizes are involved, and for intermittent service. Bearings incorporate one-piece inner and outer steel races, ground to close tolerances, and high micro finish in ball grooves. Bearings are available in three types—double-shielded, with one shield, or without shield. Ball Bearing Company, Philadelphia.



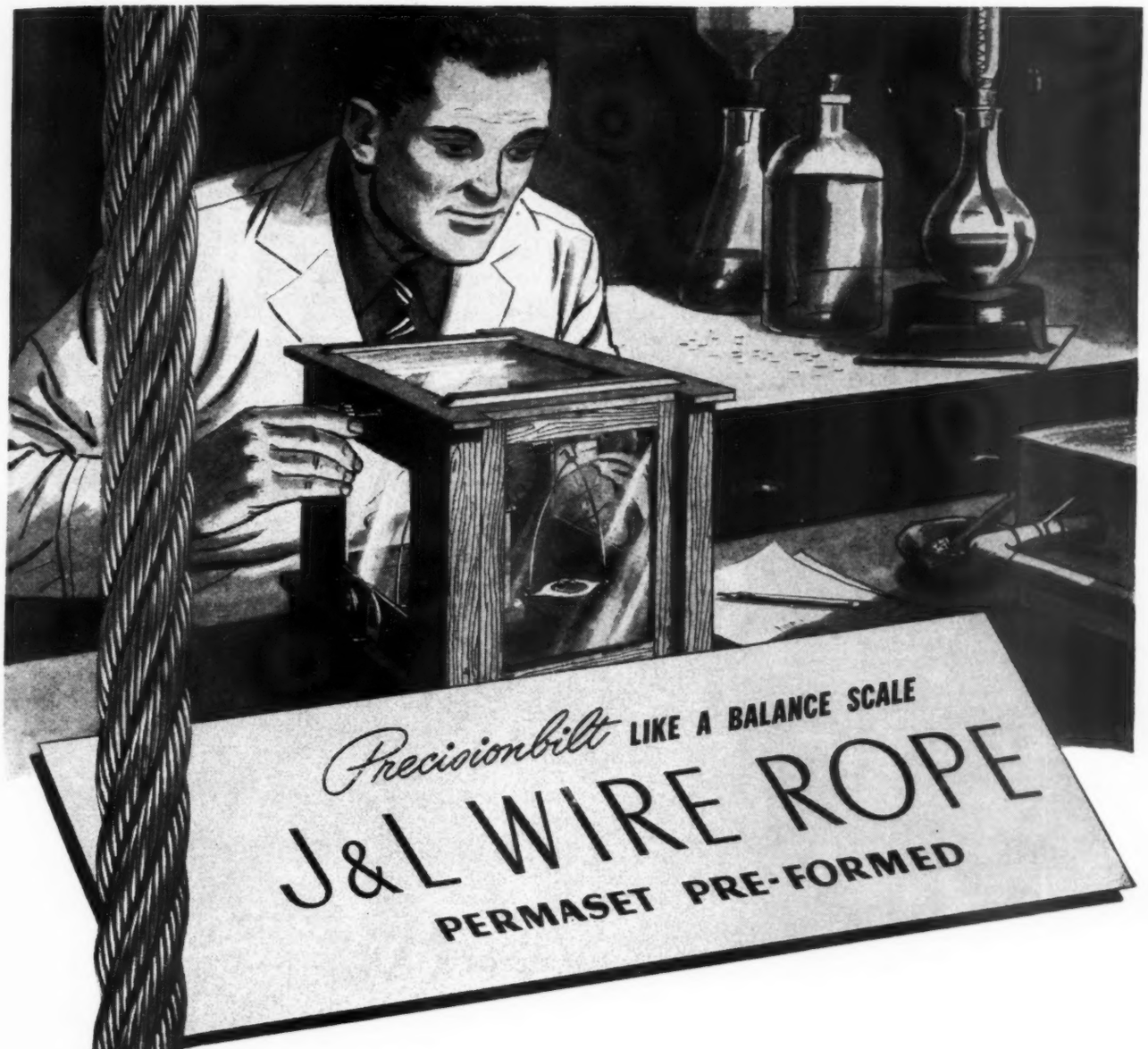
V-BELT SHEAVE—called Taperlock, is installed by slipping sheave and bushing assembly on shaft and tightening two or three locking screws, according to size of sheave. Construction provides a mounting of minimum dimensions for accommodation of the screws and their connection with hub and bushing. Permits use of flangeless bushing, and eliminates extension of either hub or bushing, or any collars or protruding parts. Dodge Manufacturing Corporation, Mishawaka, Ind.



ROLLER BEARING—Self-aligning, spherical, antifriction roller bearing is adaptable to heavy-duty applications, including machinery in paper mills, steel mills, oil production, mines, and quarries. Features two-directional thrust, high radial capacity, high thrust capacity, and unit construction to simplify installation. Torrington Company, South Bend, Ind.



VARIABLE SPEED DRIVE — Model HT2 hydraulic variable speed transmission is equipped with an axial air-gap type, built-in, electric drive motor, and is supplied in 2-, 3-, and 5-hp. size ratings. Infinitely variable speeds throughout the range are said to be instantly available. Unit provides starting torque for heavy load starting. Portman Machine Tool Company, New Rochelle, N. Y.



Precisionbilt, like a balance scale, J&L Permaset Pre-formed Wire Rope is designed for balance and built for quality by men of experience and skill.

J&L Precisionbilt Permaset Pre-formed Wire Rope is made of J&L Controlled Quality steel—it has the strength and stamina for the toughest jobs.

J&L STEEL

JONES & LAUGHLIN STEEL CORPORATION

GILMORE WIRE ROPE DIVISION

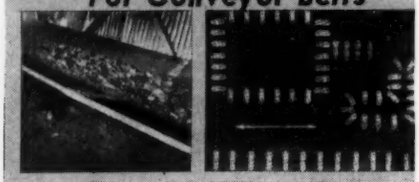
PITTSBURGH 30, PENNSYLVANIA

J&L *Precisionbilt* PERMASET PRE-FORMED WIRE ROPE

Present Day Practice in Belt Fastening

Every man who has anything to do with the purchase, application or maintenance of conveyor, transmission or V-belts will find the bulletins listed below of considerable value in connection with belt fastening work. A knowledge of present day practice in belt fastening helps reduce the loss in machine hours due to belt failures caused by the use of the wrong type of fastener or improper application. We shall be glad to send any or all of them to you or to any of the men in your organization.

For Conveyor Belts



FLEXCO HD Belt Fasteners are used to make a "water-tight" butt joint in conveyor belts ranging from ¼" to 1½" thick and of any width. The view on the right shows the various types of rips and patches that can be made with these fasteners and Flexco HD Rip Plates.

Bulletin F-100 gives complete details on how to fasten and repair conveyor belts.

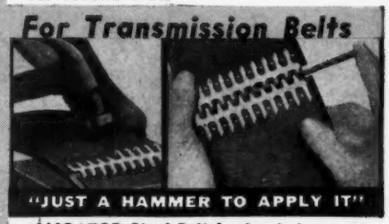
For V-Belts

ALLIGATOR V-Belt Fasteners are now being widely used to fasten B, C and D, open-end V-belting of cross woven fabric core construction now being made by most belting manufacturers. The view at the left shows a typical application of these fasteners to a drive where endless V-belts would require dismantling the machinery to put the belts on the sheaves.

Bulletin V-205 gives complete instructions on how to use V-belt fasteners.

FLEX V Fasteners for A and B belts are also available for lighter duty V-belt drives. Ask for **Bulletin V-14.**

For Transmission Belts



ALLIGATOR Steel Belt Lacing is in world-wide use to make smooth, flexible joints in leather, rubber, balata, stitched canvas or solid woven belts up to ⅜" thick and as wide as they come.

Bulletin A-60 tells how to fasten and repair transmission belts.

Sold by Supply Houses Everywhere

FLEXIBLE STEEL LACING COMPANY
4678 Lexington Street, Chicago 44, Ill.

what's new in equipment

CONTROL VALVES

Known as Hydro-Shear, 3000 to 5000 p.s.i. hydraulic and pneumatic control valves include ¼-in. 4-way selector valve with handle load of 15-in.-lb. torque at 1500 p.s.i. pressure, and 20-in.-lb. at 3000 p.s.i. Total pressure drop is less than 30 p.s.i.

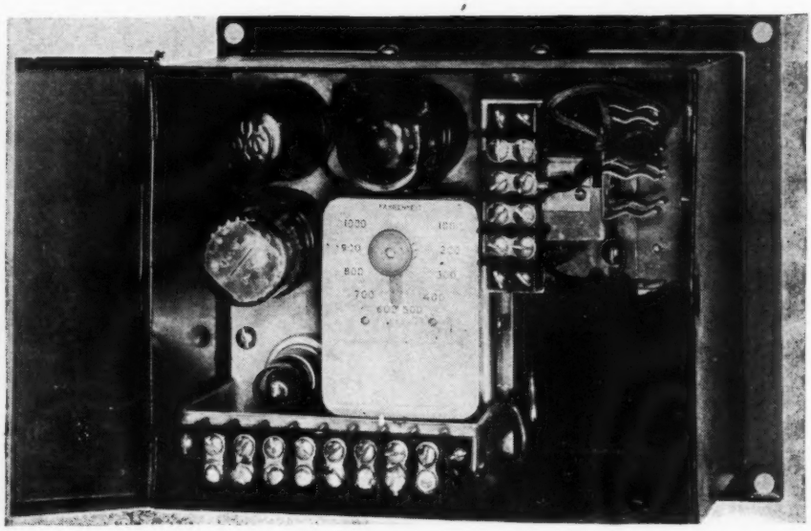
at 35 g.p.m. Low handle loads and the leakproof characteristics of the valves are said possible by their "shear-seal" design, and the use of ball bearings to reduce high frictional loads. Saval Co., Dept. F., 1915 East 51 St., Los Angeles 11.

THERMAL PROTECTOR

Thermocouple actuated limit switch is designed to protect air ducts on industrial ovens, dryers, bearings of large motors, blower wheels, flue gas stacks of boilers, plastic injection presses, and reheaters. Tamper-proof operating knob located in the case sets temperature chosen as the high limit. When this is reached, the device stops the apparatus before excessive damage is done, or it can be adjusted to sound an alarm or to light. If desired, any or all of these functions can be performed at the same time. The protector also gives warning in case of burning off or breaking of thermocouple, failure of power supply, tube, or mercury switch. Switch must be manually reset after interruption. The thermal protector is made with two ranges—100 to 1000 deg. F., and 800 to 2000 deg. F. Operates on 115-230 volts, 60-cycle a.c. Manning, Maxwell & Moore, Inc., Bridgeport, Conn.

FLEXIBLE COUPLING

Coupling for oil burners and air conditioning units is also applicable to other machines requiring maximum flexibility. CX Double-flex cannot fall off when driving, according to the manufacturer, and driven units, such as an oil burner blower fan and motor, are separated for servicing. The L-R coupling, of one-unit construction,



IT'S NOT ONLY *Which* CUTTING MATERIAL

BUT HOW YOU USE IT THAT COUNTS

Have you a copy of the Allegheny Ludlum "Fabrication Blue Sheet"?

Contains a wealth of reliable, certified data, not only on the machining of Allegheny Metal, but on the best methods employed in other fabrication operations on stainless steel—forming, welding, finishing, etc. Write for your copy—you'll find it highly useful and complete.

ADDRESS DEPT. FM-44

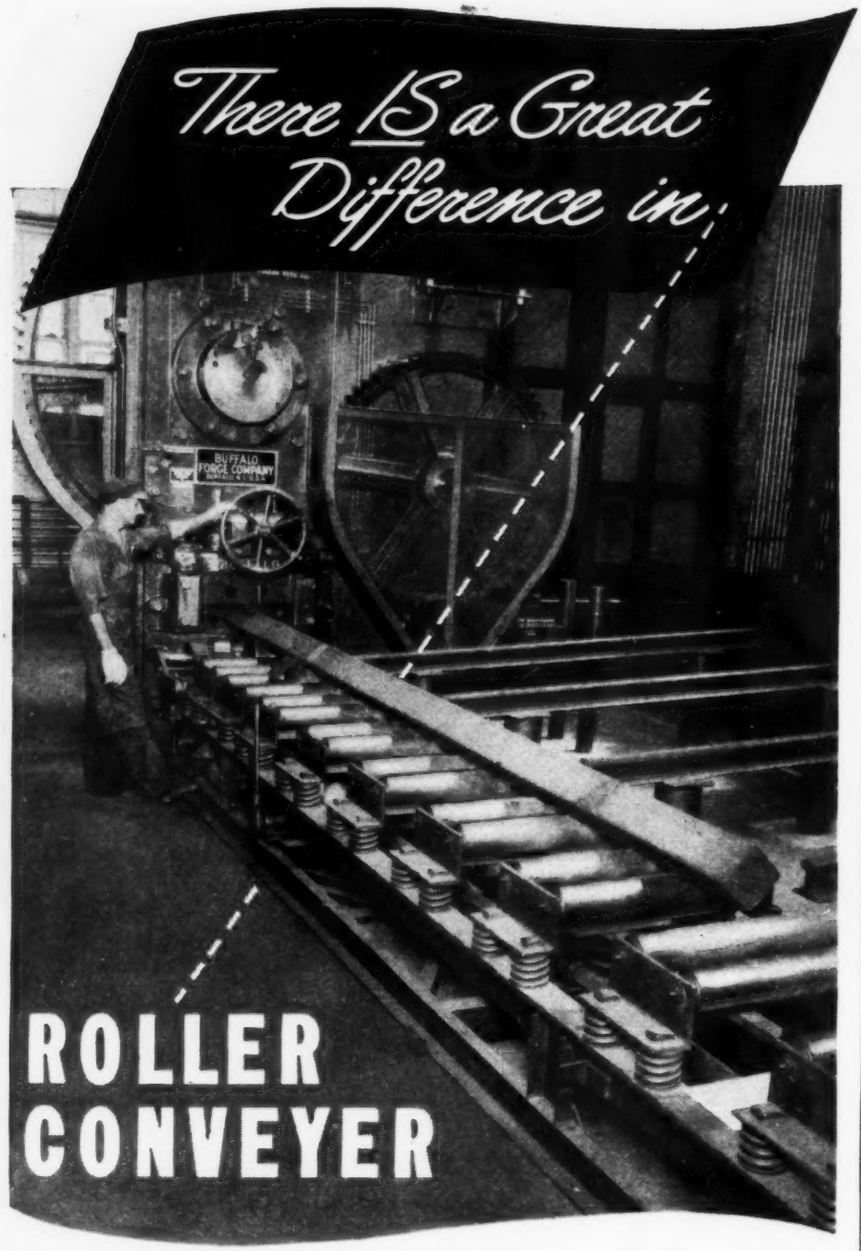
THERE'S hardly a single cutting operation that can't, in some way, be improved. Our record files contain hundreds of instances. Redesign of the tool itself often works wonders. In other cases, a switch of cutting materials shows a marked increase in production, or in pieces between grinds.

That's the job of our Mill Service organization—to work with you for improvement—and the Allegheny Ludlum line now offers you absolutely complete selection. The range extends from Carmet carbide metal blanks and tipped tools—through ALX cast alloy-metal ground bits—to DBL and Super DBL low-tungsten high speed steels, as well as the various high-tungsten and "moly" types of high speed steels. Call us in, any time, anywhere.

ALLEGHENY LUDLUM STEEL CORPORATION

General Offices
Pittsburgh 22, Penna.

W&D 9331-C



WHEN you buy Roller Conveyer, keep in mind the service that you should expect from it. While two sections of different manufacture may appear to be of identical design, actually there is probably a vast difference in them. The gauge and quality of tubing used — the design of the bearings and the method of their lubrication. The size and style of axles, and the method of securing them in the frames. The construction and crossbracing of the frames. The couplings and supports. The weight and strength of the section. These are points which should be considered important. They quickly show that there is a difference in Roller Conveyer.

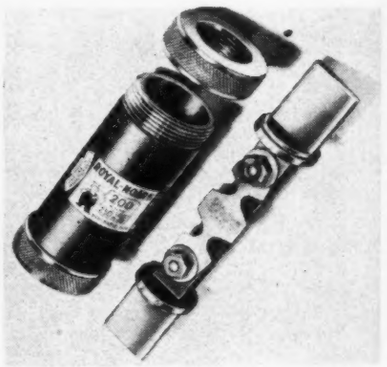
There is 40 years' experience behind Mathews Roller Conveyer. It is engineered to give long, efficient service, and each section is designed to meet specific customer requirements. We will gladly mail you complete data without obligation.

MATHEWS CONVEYER COMPANY
ELLWOOD CITY, PENNSYLVANIA
SAN FRANCISCO, CAL. • PORT HOPE, ONT.
ENGINEERING OFFICES IN PRINCIPAL CITIES

comes out with the shaft when pump or motor is moved. The device is permanently inserted into the molded synthetic rubber unit, which is secured to pump shaft by a setscrew. Molded into the other end are the L-R sockets that engage L-R jaws on the blower hub. Other features claimed are, quick assembly in dark or close quarters, no metal to metal contact, tight-fit, and deep center hole allowing shaft to extend ½ inch into unit. Six sizes, ranging from 2¼ to 5 inches in length. Lovejoy Flexible Coupling Co., 5009 West Lake St., Chicago 44.

RENEWABLE FUSE

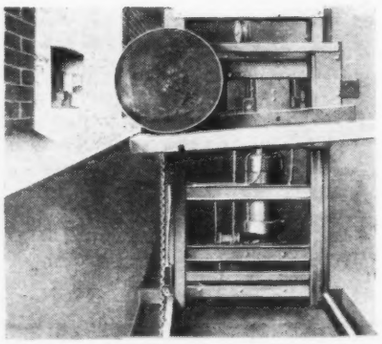
Renewable cartridge fuse is constructed to eliminate overheating and provide proper venting; to permit quick, easy renewal and assembly; and to increase life of fuse. Every part is replaceable; after the link has been renewed, either end of blade

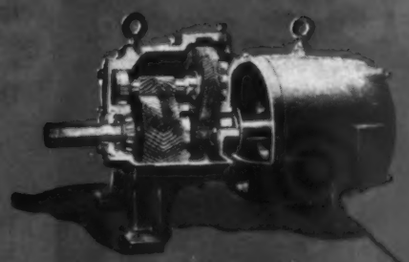


assembly can be inserted into the casing and fastened by screwing on the cap. There are no lugs to locate, or slots to find. Royal-Noark renewable fuses are boxed in packages for all sizes from 3 to 600 amps, both 250- and 600-volt. Royal Electric Co., Inc., Pawtucket, R. I.

BARREL LOADER

Combined elevating and unloading machine, an adaptation of a short-lift, portable, non-revolvable elevator, incorporates the Zee bar and other features of manufacturer's standard line. A standard motor hoist unit is used, consisting of herringbone and worm gears, motor, and magnetic brake in one sealed unit, with all shafts running in oil on ball and tapered roller bearings. Outboard end of shaft is carried on self-aligning precision ball bearings. The automatic high-speed barrel





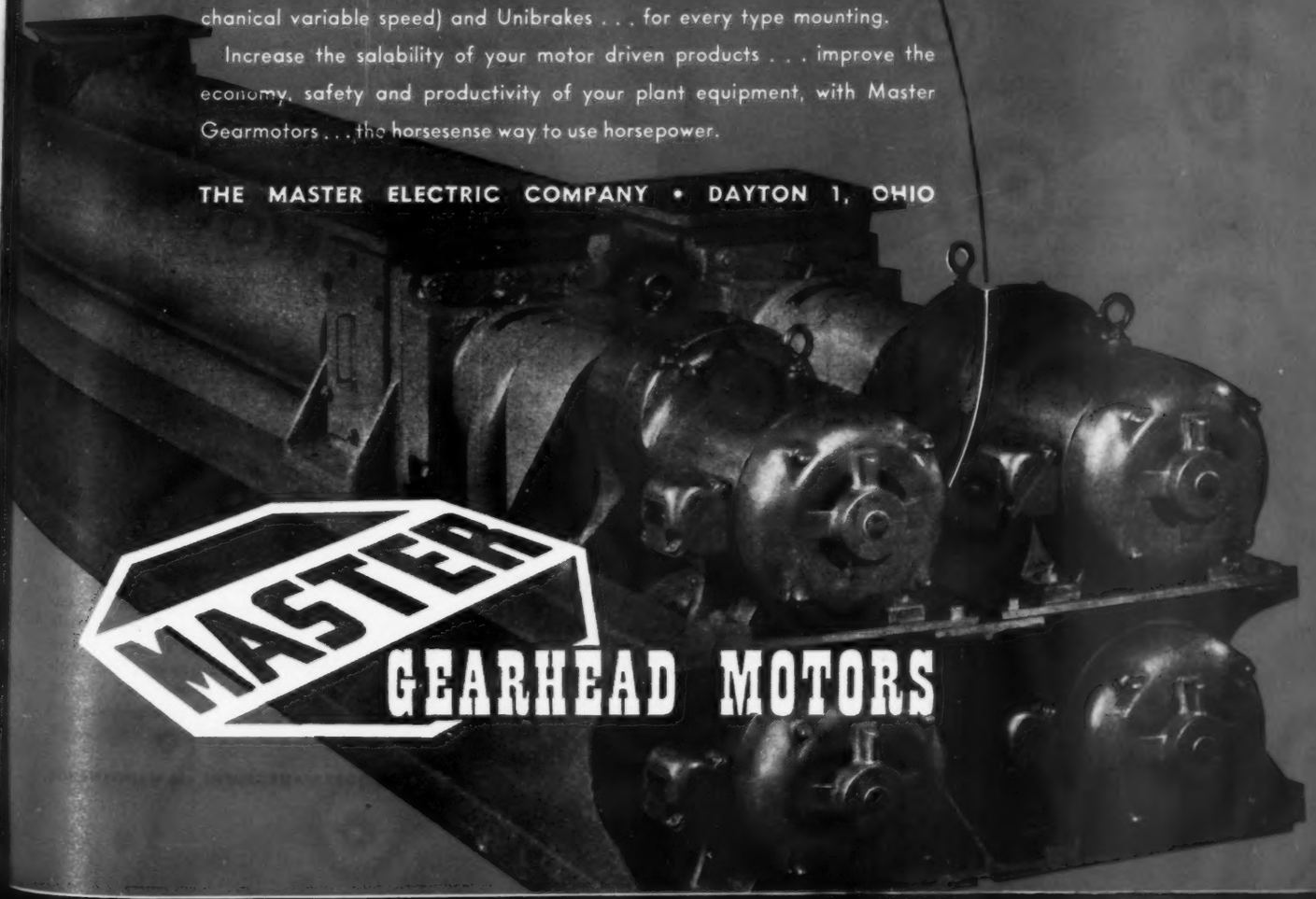
the RIGHT *horsepower*
the RIGHT *shaft speed*
and RIGHT *where you want it*

That's the horsesense way to use horsepower. See how the designer of this cement cooling equipment has secured power right where he needs it . . . and at exactly the right speed. Easy to order, easy to use, he has saved himself time, space and money by using these compact, integrally built power units. How else could he have secured such a clean cut, economical design.

And nowhere, but in the Master line of Gearmotors, could he have found power units that are so flexible, so easily adaptable and in such a wide range of sizes and types. They are available in any size, 100 HP and smaller . . . for all cycles, phases and frequencies . . . in open, splash proof, totally enclosed, fan cooled and explosion proof types . . . with Speedrangers (mechanical variable speed) and Unibrakes . . . for every type mounting.

Increase the salability of your motor driven products . . . improve the economy, safety and productivity of your plant equipment, with Master Gearmotors . . . the horsesense way to use horsepower.

THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO



MASTER

GEARHEAD MOTORS

DETECTO offers a scale that cuts production time in half

Reconversion provides an opportunity at long last to re-evaluate your weighing operations — to check *all* your scales for accuracy, speed, and for ways of reducing operating costs. Whatever you weigh or checkweigh with the Detecto-Gram Speed Scale,

One operator does the work of two

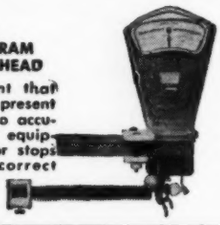
The Detecto-Gram Speed Scale is built for lightning-fast-work, twice as fast as ordinary scales—having minimum indicator swing — short fall — end tower design — extra dial legibility. Truly a DETECTO product — super accurate, sensitive, precision built, sturdy, and long wearing. *Available for immediate delivery in aluminum.* Call a Detecto-Gram industrial weighing methods engineer and place your whole "reconversion-in-weighing" problem before him.

DETECTO SCALES end "guess" weighing

DETECTO-GRAM ALUMINUM SPEED SCALE FOR IMMEDIATE DELIVERY

 # 1800 DETECTO-GRAM INDICATOR HEAD

An attachment that converts your present beam scales to accurate weighing equipment. Indicator stops instantly at correct weight.



DETECTO · SCALES · INC.

MAKERS OF FINE SCALES SINCE 1900

208 MAIN STREET • BROOKLYN 1, N. Y.

SCALE ENGINEERS IN ALL PRINCIPAL CITIES

loader is countersunk in position so that the top of the platform when lowered is flush with the floor. Barrels are rolled onto the platform by hand. Switch raises platform, and when it reaches proper height for unloading, it is tilted so that barrel automatically rolls off, and on to upper level. Platform then automatically returns to lowered position for next load. Revolvator Co., North Bergen, N. J.

CUTTING TORCH

Portable oxy-acetylene cutting outfit, known as Pak-Kut, weighs 56 pounds. It includes two aeronautical shatter-proof oxygen cylinders (with combined capacity of 44 cubic feet), an acetylene tank of 10-cu.-ft. capacity, pre-set regulators, test gage, hoses, cutting torch, wrench, goggles, gloves, and instruction manual. The entire outfit is mounted in a flame-resistant canvas pack which can be strapped

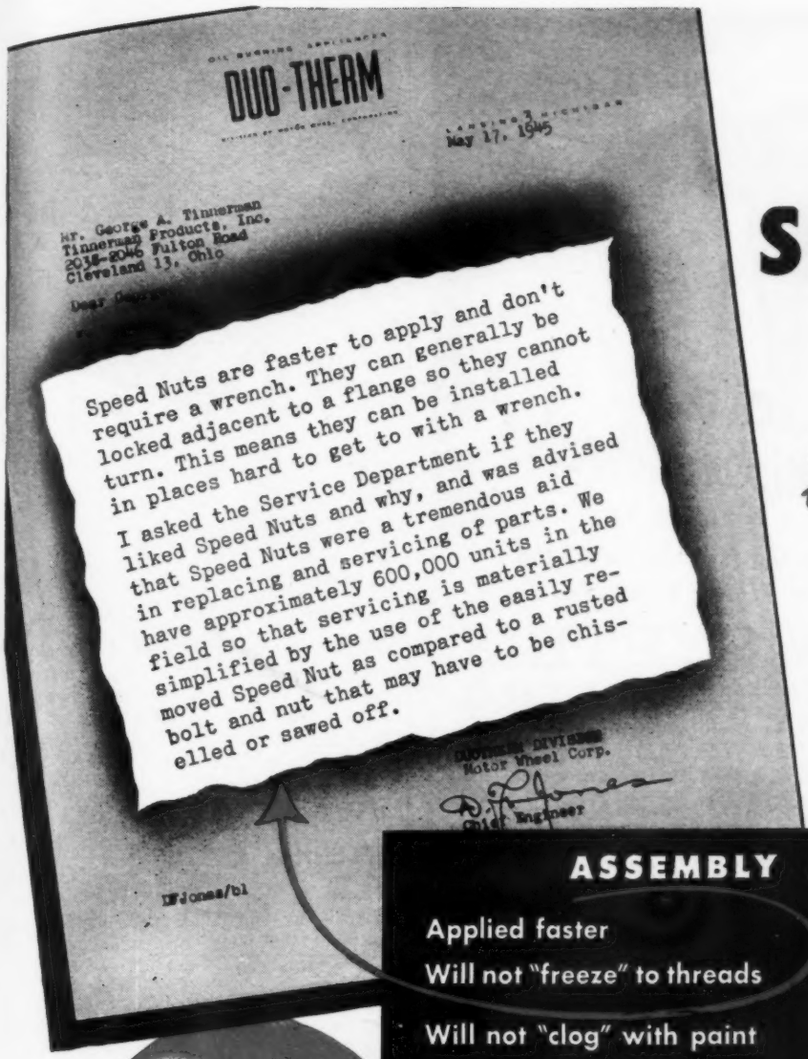
across the shoulders and buckled in a comfortable position. It is packaged in aluminum case for storage when equipment is not in use. Both oxygen and acetylene are supplied by factory preset regulators. All parts required for operation remain connected at all times for instant use. National Welding Equipment Co., 218 Fremont St., San Francisco.

POWDER LUBRICANT

Dry powder lubricant, called Grafize, is applied by the bellows-type carton in which it is packed and sealed. Fine as face powder, it is said to cover and effect positive lubrication on every part to which it is applied, to stand extremely high temperatures, and not to freeze at temperature as low as 40 degrees below zero. It is light gray in color, and is said not to soil hands or clothing. Schmidgall Mfg. Co., 307 Cass St., Peoria 2.

ROTARY ACCUMULATING TABLE

Acting as a parking space for a conveying system, rotary accumulating table temporarily takes care of overload of materials on the conveyor when feed is greater than disposal. The table consists of a unit with a square base and round flat steel top, on which revolves a disk where the conveyed materials rest. Disk is automatically motor

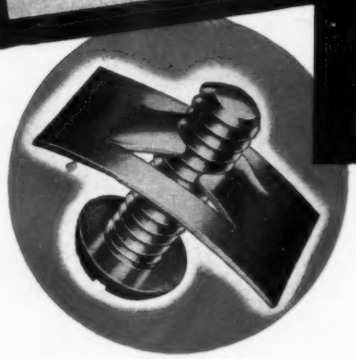

DUO-THERM
May 17, 1945
Mr. George A. Tinnerman
Tinnerman Products, Inc.
2038-2046 Fulton Road
Cleveland 13, Ohio
Speed Nuts are faster to apply and don't require a wrench. They can generally be locked adjacent to a flange so they cannot turn. This means they can be installed in places hard to get to with a wrench.
I asked the Service Department if they liked Speed Nuts and why, and was advised that Speed Nuts were a tremendous aid in replacing and servicing of parts. We have approximately 600,000 units in the field so that servicing is materially simplified by the use of the easily removed Speed Nut as compared to a rusted bolt and nut that may have to be chiselled or sawed off.
Motor Wheel Corp.
Chief Engineer
DFJones/bl

Let SPEED NUT USERS tell you why They Changed to SPEED NUTS

No. 2 in a series, "The Customer Talks"

ASSEMBLY ADVANTAGES

- Applied faster
- Will not "freeze" to threads
- Will not "clog" with paint
- Reduce assembly costs
- Eliminate lock washers
- Eliminate handling of material
- Perform multiple functions
- Weigh less
- Prevent vibration loosening
- Protect fragile materials against damage



Let Duo-Therm's Chief Engineer, D. F. Jones, tell you what *he* thinks. His letter above leaves no doubt about the advantages of SPEED NUTS in the manufacture and servicing of hundreds of thousands of fuel oil heaters by the Duo-Therm Division of Motor Wheel Corporation.

SPEED NUTS help keep down the costs on Duo-Therm's modernized assembly lines. And the ease with which SPEED NUTS are removed greatly speeds up servicing their units in the field.

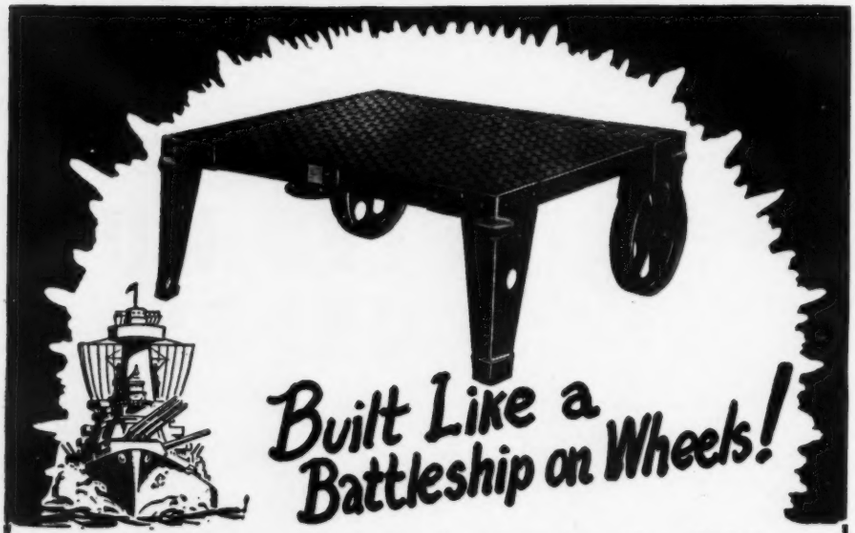
Why postpone the improvement of *your* product assembly? Eliminate waste motions, unnecessary parts and useless weight by changing to SPEED NUTS. Send your complete assembly details when writing for samples as SPEED NUTS are made in over 3,000 shapes and sizes.

TINNERMAN PRODUCTS, INC. • 2096 FULTON ROAD, CLEVELAND 13, OHIO

In Canada: Wallace Barnes Co., Ltd., Hamilton, Ontario
In England: Simmonds Aerocessories, Ltd., London
In France: Aerocessoires Simmonds, S. A., Paris
In Australia: Simmonds Aerocessories, Pty. Ltd., Melbourne

Speed Nuts★
PATENTED
★Trade Mark Reg. U. S. Pat. Off.

FASTEST THING IN FASTENINGS



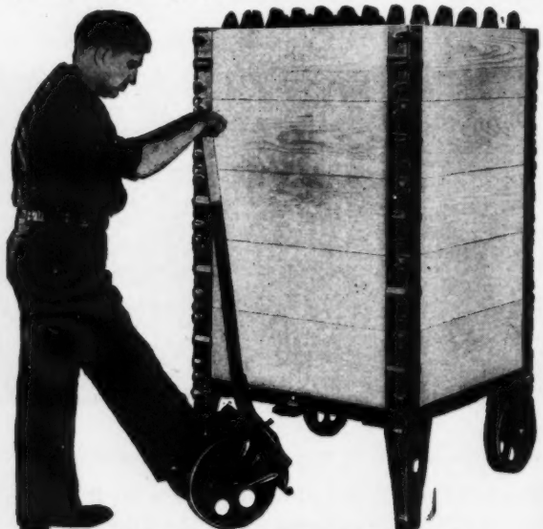
Built Like a Battleship on Wheels!

You Get Rugged, Enduring Construction PLUS the Utmost in Efficiency When You Use

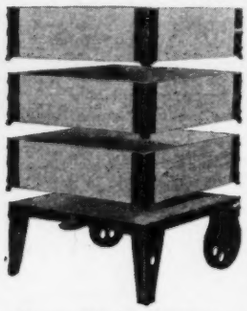
THE TURNER SYSTEM
OF MATERIALS HANDLING

Turner Equipment is REALLY RUGGED — it's built to stand up and "take it" during years of hard, rough usage . . . and still serve just as efficiently as when it was new. That's why your investment in the TURNER SYSTEM from the standpoint of EQUIPMENT will pay big dividends.

But frankly, your investment from the standpoint of EFFICIENCY will pay BIGGER DIVIDENDS! For more than a quarter century we have been providing the complete, co-ordinated TURNER SYSTEM OF MATERIALS HANDLING which has cut LABOR, SPACE and EQUIPMENT COSTS up to 50% for many American manufacturers.

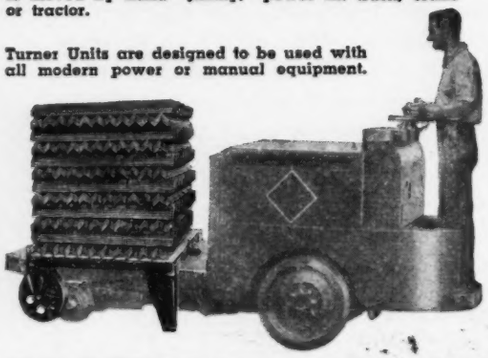


One man does the work of several with the Turner System—because you can "DELIVER THE BIN AND SAVE THE HANDLING." Bin Sections, Racks, Section Trays, Die Tables fit on the Turner Transport which is moved by hand "Jimmy," power lift truck, crane or tractor.



Removable Bin Sections.

Turner Units are designed to be used with all modern power or manual equipment.

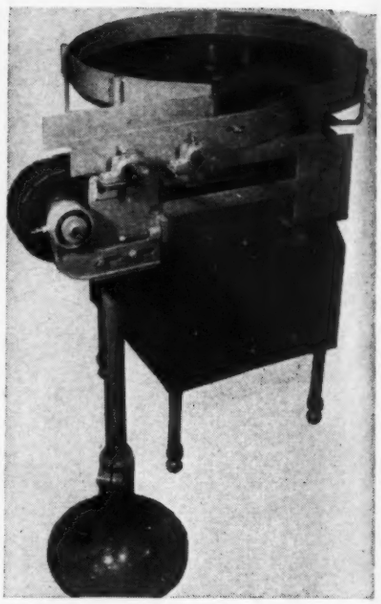


60 DAYS' FREE TRIAL

You may see for yourself how the TURNER SYSTEM works in your own plant. We are willing to ship an assortment of standard units on 60 DAYS FREE TRIAL. Send for them at once. Keep them for two months. Return them if they don't do the job. The trial costs you nothing except transportation charges. Write today asking us to send this assortment to you. Complete information will follow immediately.

A twenty-page book completely outlines the Turner System and is sent without charge to established companies. Write on your letterhead for your copy.

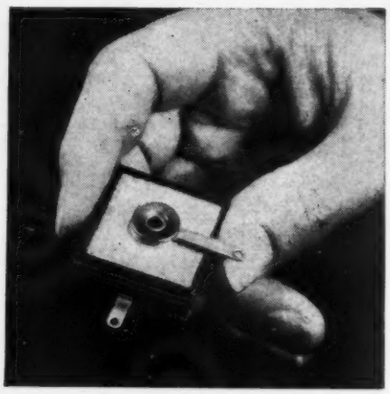
FACTORY SERVICE COMPANY
4605 N. TWENTY-FIRST ST. MILWAUKEE 6, WISCONSIN



driven at any desired speed, for synchronization with speed of conveyor. Shape of table permits maximum number of operators. Guard plate on outer edge of disk top keeps contents from falling off. Island Equipment Corp., 101 Park Ave., New York 17.

SELENIUM RECTIFIER

Known as Type 403D-2625, rectifier consists of five square selenium plates made on aluminum base plates, connected in series, with center contact. It measures 1¼x1¼x11/16 inch. Only two soldering



operations are necessary, and a minimum of mounting hardware. The unit has a rated current-carrying capacity of 100 milliamperes d.c. and a peak inverse voltage of 330 volts. Federal Telephone & Radio Corp., Newark, N. J.

POWER UNIT

Model 600 Power Package consists of a 6-hp. lightweight, single-cylinder, 4-cycle, air-cooled engine; an automatic, self-shifting transmission; and an automatic centrifugal driving clutch. Smooth-starting, with high torque capacity; variable range of speeds within its high and low ratio limits without gear shifting; and a smooth

Where corrosive vapors and dust *are a problem...*

WESTINGHOUSE MILLITE, with vapor and dust-tight cover of heat and impact-resisting glass. Easy to service. Available in 300 to 1000-watt incandescent and 400-watt mercury types.

The Millite is especially designed for steel mills, foundries, chemical plants, boiler rooms, welding shops, railroad shops—wherever excessive dust or moisture in the air might cause corrosion or excessive maintenance of open-type luminaires.

Millite provides controlled illumination in high bay areas. The heat-tempered, impact-resisting, hinged glass cover permits easy access for lamp replacement.

For full information on this or other units in the complete Westinghouse line of industrial lighting equipment, contact your nearest Westinghouse Lighting Distributor. Or write for Millite folder F-8408-A. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

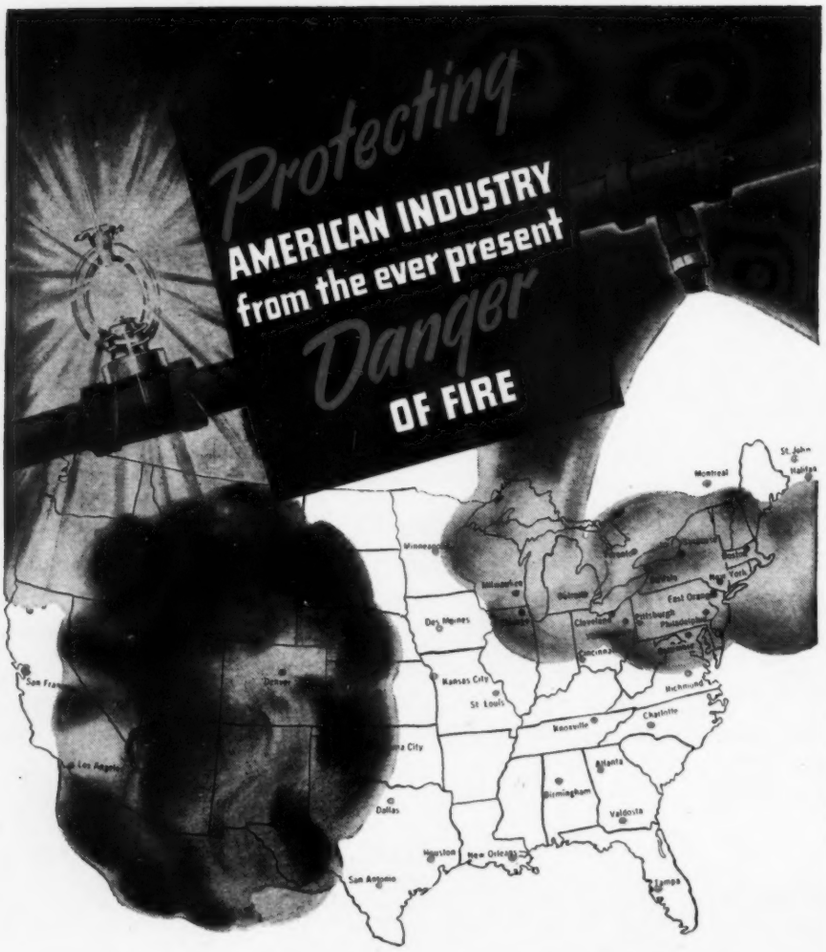
J-04096

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

PLANNED LIGHTING

AVAILABLE THROUGH 127 WESTINGHOUSE ELECTRIC SUPPLY OFFICES AND INDEPENDENT JOBBERS



The map above locates the many "Automatic" Sprinkler offices. There are 37 of them, in an area extending from coast to coast and from Texas to Canada. These offices are manned by a staff of thoroughly qualified fire protection engineers, men who are familiar with all types of fire hazards and the various systems best suited for protection. They'll be glad to show you how to safeguard your plant, equipment and production from the ever present danger of fire.

Our new Bulletin No. 56 explains in detail the operation of the various "Automatic" Sprinkler systems. Write for your copy today . . . it's free. Use the coupon.

MAIL THIS

"Automatic" Sprinkler Corporation of America
P. O. Box 360 Youngstown 1, Ohio

Please send me a copy of your Bulletin No. 56, which contains descriptions of modern fire protection systems. 4

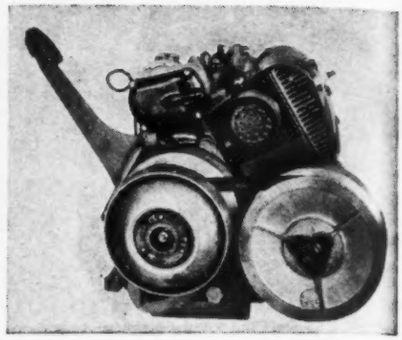
Name.....
Company.....
Title.....
Address.....
City..... State.....

"Automatic" Sprinkler

"AUTOMATIC" SPRINKLER CORPORATION OF AMERICA

YOUNGSTOWN, OHIO . . . . . OFFICES IN 37 CITIES

"Automatic" Sprinkler designs, manufactures and installs a complete line of fire protection devices and systems for all types of fire hazards. Listed by Underwriters' Laboratories, Inc., and approved by Factory Mutual Laboratories



steady flow of power in spite of momentary under or overloads are features claimed for the unit. Speeds available from output shaft vary from 500 r.p.m. in low, with full torque, to 5000 r.p.m. in high. A normal over-all change in ratios of 4 to 1 is obtained. The power package may be coupled directly, geared, chained, or belt driven. Manufacturer supplies only the primary drive. Salsbury Motors, Inc., Pomona, Calif.

ASBESTOS GLOVES AND MITTENS

Line of asbestos gloves and mittens features thumb arrangement on the leather reinforced styles which covers the thumb with additional leather reinforcement at points of hardest wear. Reinforced on

palm and thumb, or palm, fingers, and thumb, they are suitable for heavy-duty work, such as handling hot metals with sharp edges. All styles are available in different lengths. Safety Clothing & Equipment Co., 7016 Euclid Ave., Cleveland.

COMPANY CHANGES NAME

The J. M. & L. A. Osborn Company, sheet metal manufacturers located at Cleveland, and operated as a division of Milcor Steel Company, has become a part of the Milcor organization with home offices in Milwaukee.

ALUMINUM GLASS CUTTER

Lightweight Model G 1 aluminum glass cutter, for every type of glass, is said to provide a smooth, effortless cutting run,

THE SALSBURY TURRETEER

More Easily Negotiates Sharp Corners...Tight Spots...Steep Ramps

The Salsbury Turreteer (platform type) is highly maneuverable, powerful, stable and simple to operate. It will carry a 4000 lb. load and operator at speeds up to 7 m.p.h. Saves time in picking up, transporting, and spotting skids. Has 3 in. hydraulic lift.

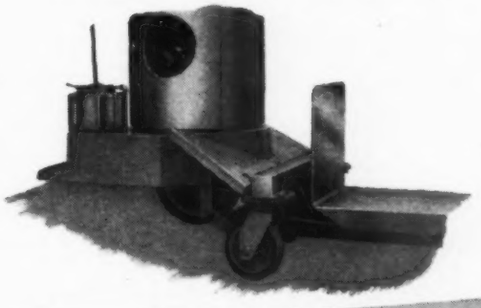
SALSBURY

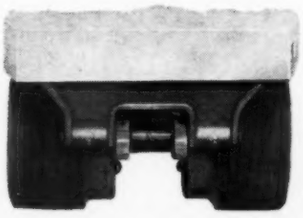
There's power inside the turret

The Salsbury Power Package, with its efficient 6 hp motor, automatic transmission and automatic clutch, is combined with the drive wheel in a single unit. Direction of travel is altered by revolving the turret, giving unusual maneuverability. Requires no batteries, no gear shift, no clutch lever, no reversing lever. Throttle and brake are the only controls.

Articulation insures shock-proof travel

Exclusive Salsbury articulation smoothes out the bumps. Four wheels are under the load at all times.





Husky and unusually stable

The Turreteer is equipped with extra wide, heavy, rubber-tired load wheels to insure stability and prevent load dumping.

For more information on Salsbury materials handling equipment, including the Turretug (tractor type), and the Turretruck (cargo type), write for Bulletin 4602-6.

SALSBURY MOTORS, INC.

1201 Lexington, Pomona, California
A subsidiary of Northrop Aircraft, Inc.

THE combined research, production and distributing facilities of three famous companies are now offered to American industry by The Colorado Fuel and Iron Corporation. Thus, a new nation-wide service is made available in steel, wire products, and allied specialties under the trade-marks of Wickwire Spencer, Calwico, and CF&I—each a standard of industrial progress in its own right.

The East and Middle West will continue to be served by Wickwire Spencer Steel Division. The Colorado Fuel and Iron Corporation will serve the Plains and Mountain States with CF&I facilities as before plus the products of the eastern and western divisions. The California Wire Cloth Corporation (a subsidiary) will supply its own products and in addition the products of the other two divisions to Pacific Coast customers.

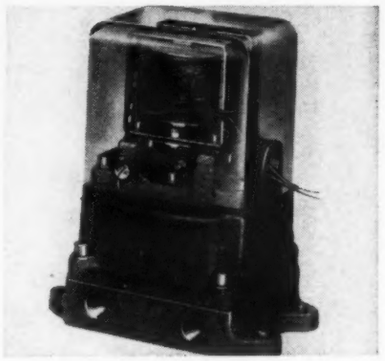
The well-earned reputation for quality which these three companies have enjoyed will be maintained in the new and greater Colorado Fuel and Iron Corporation.

CF&I
WICKWIRE SPENCER STEEL DIVISION
The Colorado Fuel and Iron Corporation
THE CALIFORNIA WIRE CLOTH CORPORATION
EASTERN SALES OFFICES 500 Fifth Ave., N.Y. 18, N.Y.
EXECUTIVE OFFICES DENVER, COLORADO
WEST COAST OFFICES OAKLAND, CALIFORNIA
KEY CITY OFFICES SEE PHONE BOOK

with maximum sensitivity. Rust-resisting, it has finger-fitting shaped handle with ball on end, and cutting wheel is made of electrically hardened and Chapmanized alloy steel honed to cutting edge that is designed to give clean cuts with minimum pressure. Requires no breaking-in. Oversize bronze bearing is said to give smoothness in operation, and maintain wheel alignment. Red Devil Tools, Irvington, N. J.

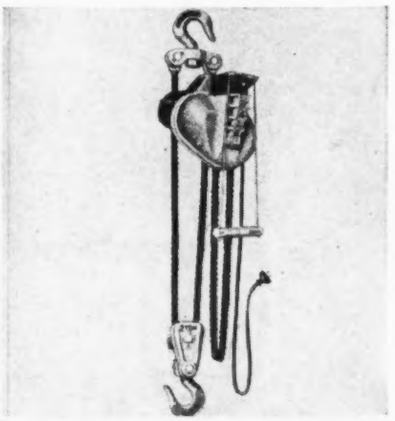
SOLENOID VALVES

Series SR-4, 4-way, solenoid-controlled 4- and 5-port valves can be mounted in any position, with either side or bottom pipe connections used. Can handle any working pressure from 0 to 150 p.s.i. One size, low amperage solenoid with 5/64-in. travel is used for all pipe sizes. The valve is available with 4-port base for single-pressure and with 5-port base for dual-pressure service. Both types of bases have side and bottom pipe connections with identical mountings. The valve body and upper structure is standard and will fit either base. Entire unit can be serviced without disturbing pipe connections, and without use of special tools. Valves are available in $\frac{1}{4}$-, $\frac{3}{8}$-, $\frac{1}{2}$-, and $\frac{3}{4}$-in. pipe sizes, but can be supplied in larger sizes. Numatics, Milford, Mich.



ELECTRIC HOIST

Line of Midget King electric hoists now includes a 2-ton model equipped with a 1-hp. motor. Lifting and lowering action is obtained by a flip of the wrist on the one-hand bar-grip control, leaving opera-

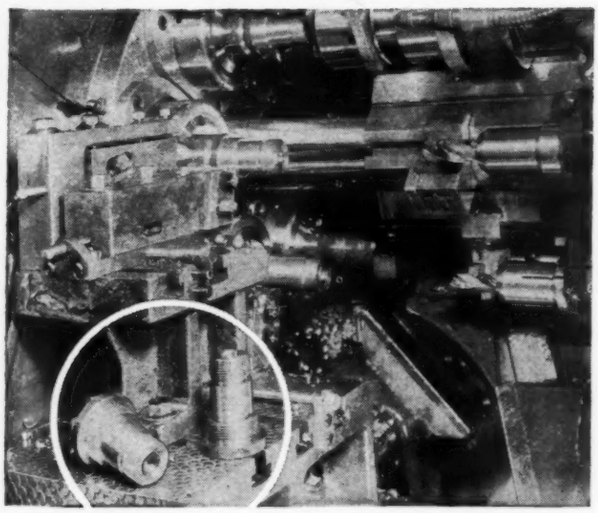


FASTER . . . . . -- less than 20 seconds!

With basic material costs and basic wage rates about the same for you as for your competitors, the one factor you can control fully is *method.*

Save *time* by better methods of production and you reduce cost.

Take for example the steel sleeve shown above, 2½ x 3¼". The 16 operations on this part are done on a 2⅝" six spindle Acme-Gridley Bar Automatic in less than 20 seconds.



Heavy roughing cuts and fine finishing produce consistently high accuracy in this fast time. Two Vers-O-Tools with ground thread circular chasers were used for the threading.

Feel free to ask us for Acme-Gridley time estimates on any precision parts you turn out in quantities — on either bar or chucking equipment.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

COLLETS AND PUSHERS

The design, materials and methods of processing GENUINE Acme-Gridley Collets and Pushers are vital to continuous low-cost performance on your Multiple Spindle Automatics.

Bulletin CP-45

Bracing carload shipment . . . Acme Unit-Load method. Doc. Steelstrap

● Carload shippers — you can reduce damage claims, increase good will, add to your profits by bracing cars with Acme Unit-Load Band. Look into Acme methods — the "floating load," the "anchor load" and others tailor-made to fit your needs.

Bound to get there — WITH ACME UNIT-LOAD BAND

NEW YORK 7 ATLANTA CHICAGO 8 LOS ANGELES 11

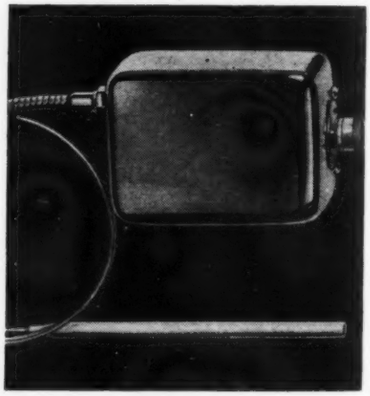
ACME STEEL COMPANY

ACME STEEL CO. CHICAGO

tor's hand free to guide the load. To carry the load, a strong, lightweight alloy steel roller chain is used. The load hook is of special steel which provides maximum safety for both load and worker, maker states, opening slowly without fracture before any other part of hoist is strained to the yield point. Upper and lower safety stops prevent overtravel of hook. Load brake and independently acting motor brake operate whether power is on or off; both brakes, all wiring, and controller are totally enclosed. Hoist can be furnished with hook for stationary use, and with permanently attached trolley for use on overhead track, as well as with other accessories. The Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia 24.

THERMOSTAT

Type O thermostat is a control of the remote-bulb type, designed for industrial applications requiring accurate control of temperatures over narrow calibrated ranges. Can be used for all liquids or gases non-injurious to brass, or for metal-to-metal applications, and can be equipped with ambient temperature compensation. Thermal assemblies can be plated or supplied in stainless steel for applications in-



jurious to brass. Control is based on snap-action switch actuated by a solidly liquid-filled copper thermal assembly. The assembly can be adjusted by either knob and pointer with calibrated dial, or by screwdriver. The calibrated adjustments cover any 120 or 250 deg. F. in the range from —120 to 600 deg. F., and screwdriver adjustments cover ranges —120 to 180 deg. F., from 50 to 350 deg. F., or from 50 to 600 deg. F. United Electric Controls Co., Corner A & Athens St., Boston 27.

PRESSURE PUMP

Positive-pressure vane-type pump, VW-1, handles non-lubricating liquids such as water. Incorporated in the pump are two composition bearings requiring no lubrication beyond that furnished by the liquid being pumped. The vanes are made of the same material as the bearing. Vane design holds them in contact with pump chamber, eliminating need for centrifugal force to maintain volumetric efficiency. Made for use in systems having a relief

50 Men from Missouri

THESE 50 people devote their full time to engineering projects aimed at making Weatherhead products *better*—for *less.* They have "to be shown" by scientific tests just how good a product really is. And then, they often reverse the situation and show *us* how we can *improve* the products you use.

Our testing laboratories are equipped to reproduce every condition under which Weatherhead products may be used. For example—

(1) A tensile strength testing device gives brake hose a 1000 pound pull. (2) Tube fittings are subjected to 1800 vibrations a minute. (3) Hot salt is sprayed on valves and fittings to test the finish.

And there are scores of other scientific tests which help our "50 men from Missouri" determine what can be done to give you *better* Weatherhead products at *lower* cost.

It's this kind of extensive testing, plus modern methods of product development, design, and manufacturing, which is making *"Look Ahead With Weatherhead"* more than a slogan!

Look Ahead with

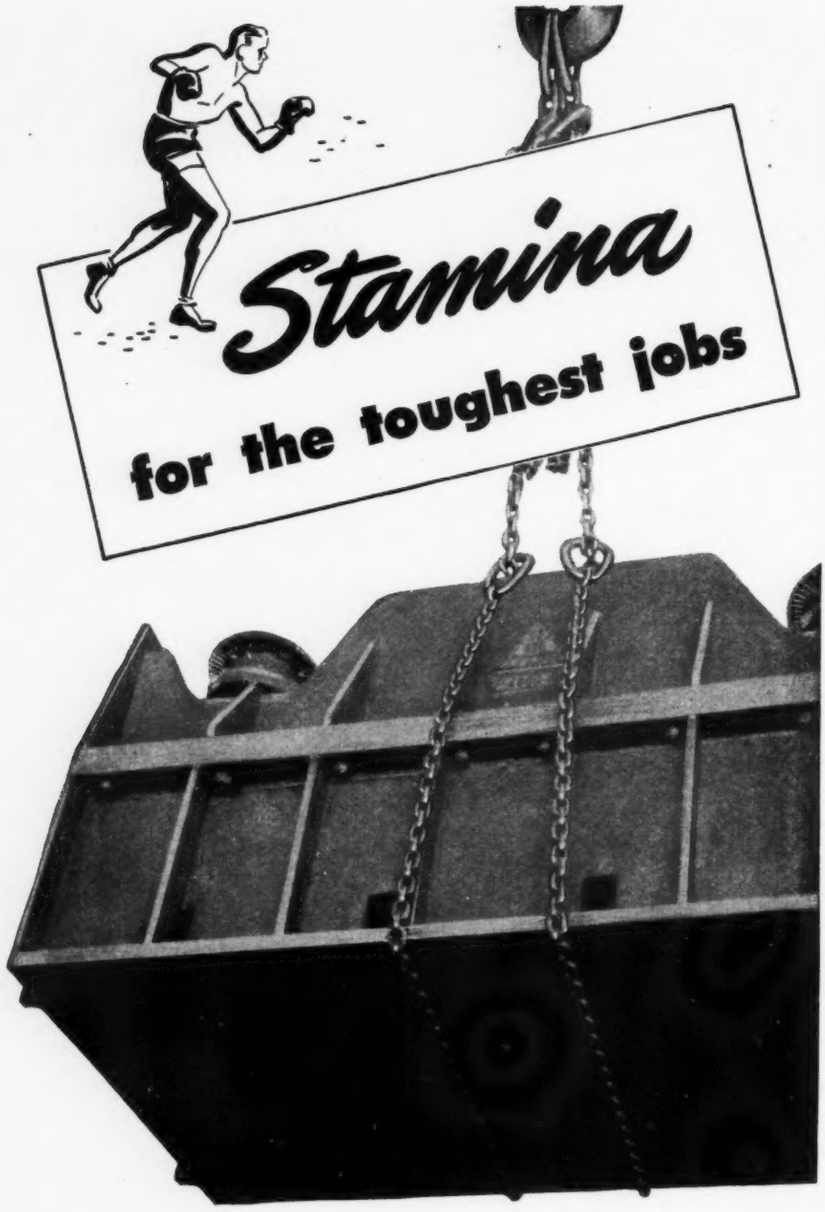
Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND 8, OHIO

NEW YORK • DETROIT • CHICAGO • ST. LOUIS • LOS ANGELES

ATTENTION AUTOMOTIVE ENGINEERS

Every car, truck or bus on the road today is equipped with Weatherhead drain cocks and fittings. Most automotive vehicles use from 1 to 10 other Weatherhead products.



GREAT athletes, like great chains, require tremendous stamina. Many TAYLOR MADE Alloy chains—put into service before the war—are still in use. Here are the reasons why. Alloy steel with twice the tensile strength of wrought iron, stress-free links made from two U-shaped half links and trained experienced craftsmen are united to give you chain that has great resistance to shock . . . grain growth and work hardness. When you buy chain, buy TAYLOR MADE chain. See your mill supply distributor or write the factory direct.

S. G. TAYLOR CHAIN COMPANY,
Dept. F 8, Box 509, Hammond, Indiana

TAYLOR MADE Chain "THE BEST BY TEST SINCE 1873."

valve, pump has no bypass valve. Shaft sealing is done by mechanical rotary seal. Delivering approximately ½ gallon per minute, the pump is suitable for operating pressure of from 0 to 30 p.s.c. and is self-priming. Has 1/15-hp. universal motor, and is available in either 110 or 220 volts a.c. or d.c. Eastern Engineering Co., New Haven, Conn.

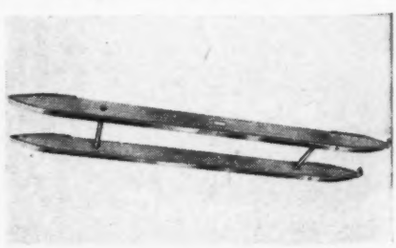
ELECTRIC WATER HEATER

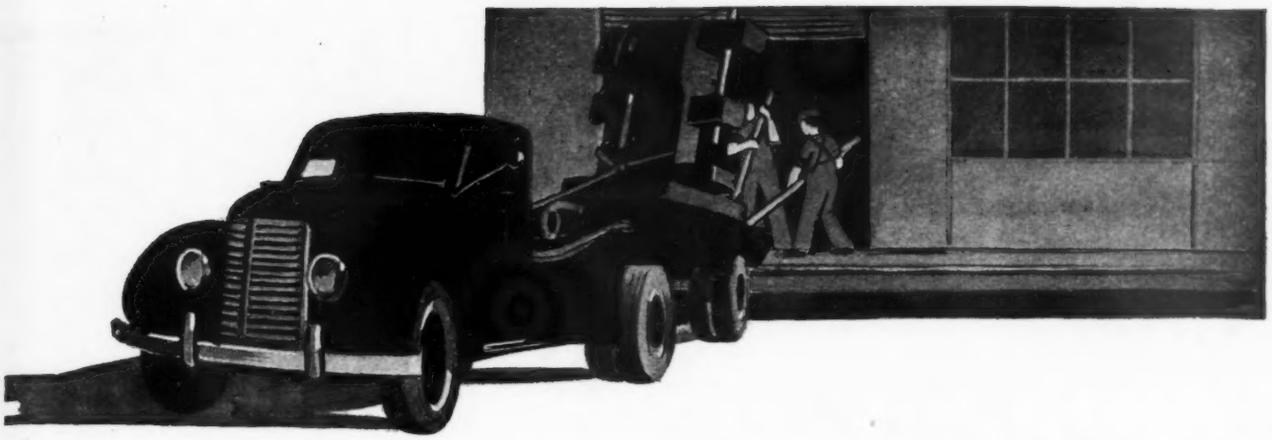
Made of stainless steel throughout, automatic electric water heaters are furnished in three sizes, with capacities of 3, 5, and 7½ gallons. According to the manu-

facturer, they feature quick heat-recovery and high heat-retention. The units operate on 110-115-volt a.c., and are installed with standard pipefittings. Modo-home Products, Inc., Bourbon, Ind.

BARREL AND DRUM SKID

Designed for fast, safe handling of barrels and drums, general-purpose skid supports load up to 1200 pounds, and is said to be





WHEN IS A MACHINE *"Washed Up"?*

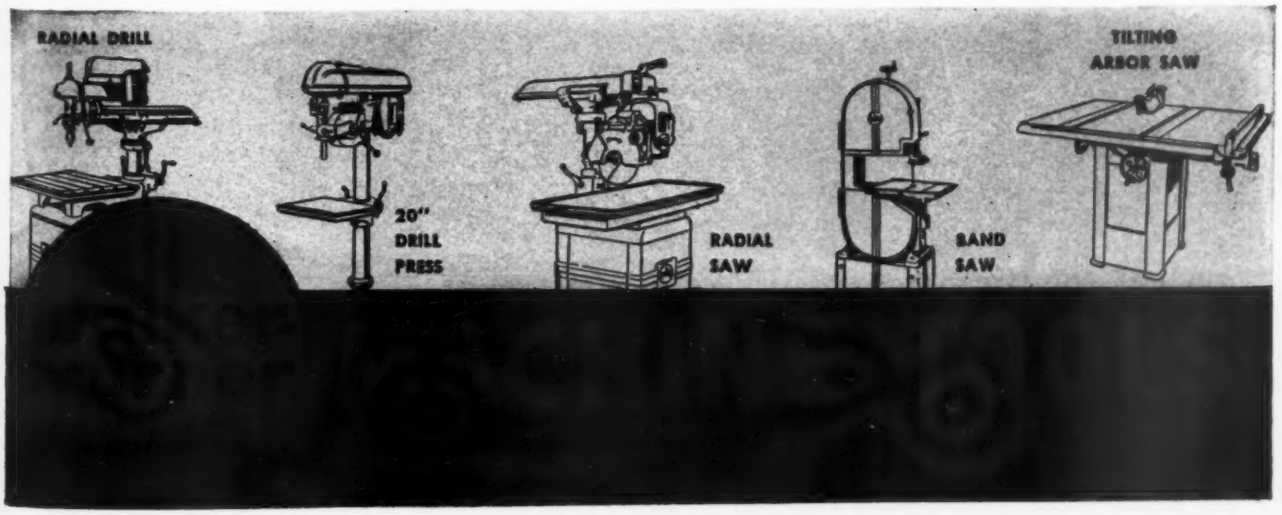
In seven years some say—but in modern production practice it is not a question of years or how much the machine has earned or still owes you. The question is, will your equipment enable you to compete with the new, faster working, more efficient and flexible layouts in your competitors' plants.

A five-year-old Machine Tool is "washed up", for instance, if it can be replaced by one costing a few hundred dollars that will write itself off in less than a year through improved production. That's the story of Walker-Turner Machine Tools wherever metals, wood or plastics are drilled, cut or shaped.

These machines are "light" only in weight and price. Their production output in the past eight years has astounded the management of thousands of plants—large and small—throughout the country.

A key to high manufacturing efficiency and low **manufacturing costs** is the modern, flexible, light machine tool. It represents small capital investment, flexibility of operation, increased productivity and low operating costs.

Walker-Turner Machine Tools are sold only by authorized Industrial Machinery Distributors. A general catalog will be sent on request.



Everybody likes a-
CHAMPION...
-and that goes for

CHAMPION
Fluorescent and *Incandescent*
LAMPS

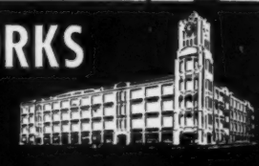
The *worker* in shop and office likes them because CHAMPION Lamps *make light work*. They have the uniform quality of illumination and lasting dependability in service that comes only from years of specialization in the manufacture of lamps for industry. They are guaranteed to equal or exceed Federal Specifications.

The *buyer* likes them because the Champion manufacturing and distribution set-up is concentrated on getting the most lighting and the most lamp value for his money. Champion Lamps for industry mean minimum lighting cost as well as lamp cost.

The *manager* likes them because of Champion's efficient field service, trained lighting experts always available and cooperating with a selected industrial distributor near the plant to assure dependable assistance on every lighting problem.

You'll **like them, too. Try CHAMPION Lamps and Champion Lamp service. Let us put you in touch with your nearest Champion source of supply.**

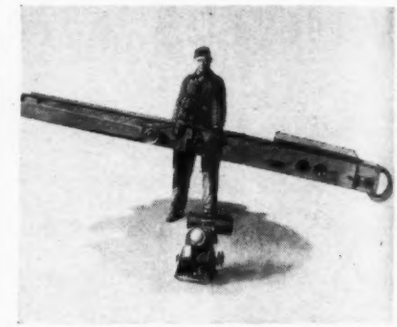
CHAMPION LAMP WORKS
Lynn, Massachusetts
A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO



built to withstand ordinary loading abuses. The hardwood rails are reinforced with heavy steel bands. Steel hooks at one end anchor skid securely to back of motor trucks or to loading platforms. Unit is light in weight and can be hung out of the way when not in use. Available in three standard sizes—8, 10, and 12 feet long. Ironbound Box & Lumber Co., 650 Hoffman Pl., Hillside, N. J.

LIGHTWEIGHT CONVEYOR

Called Tote-All Zephyr, lightweight portable conveyor is made of alloy steel, and is corrosion and abrasion resistant. Available in 12- and 16-ft. lengths, both having an 8-in. belt. The 12-ft. model weighs 135 pounds (without motor). Power is furnished by a gasoline engine which is



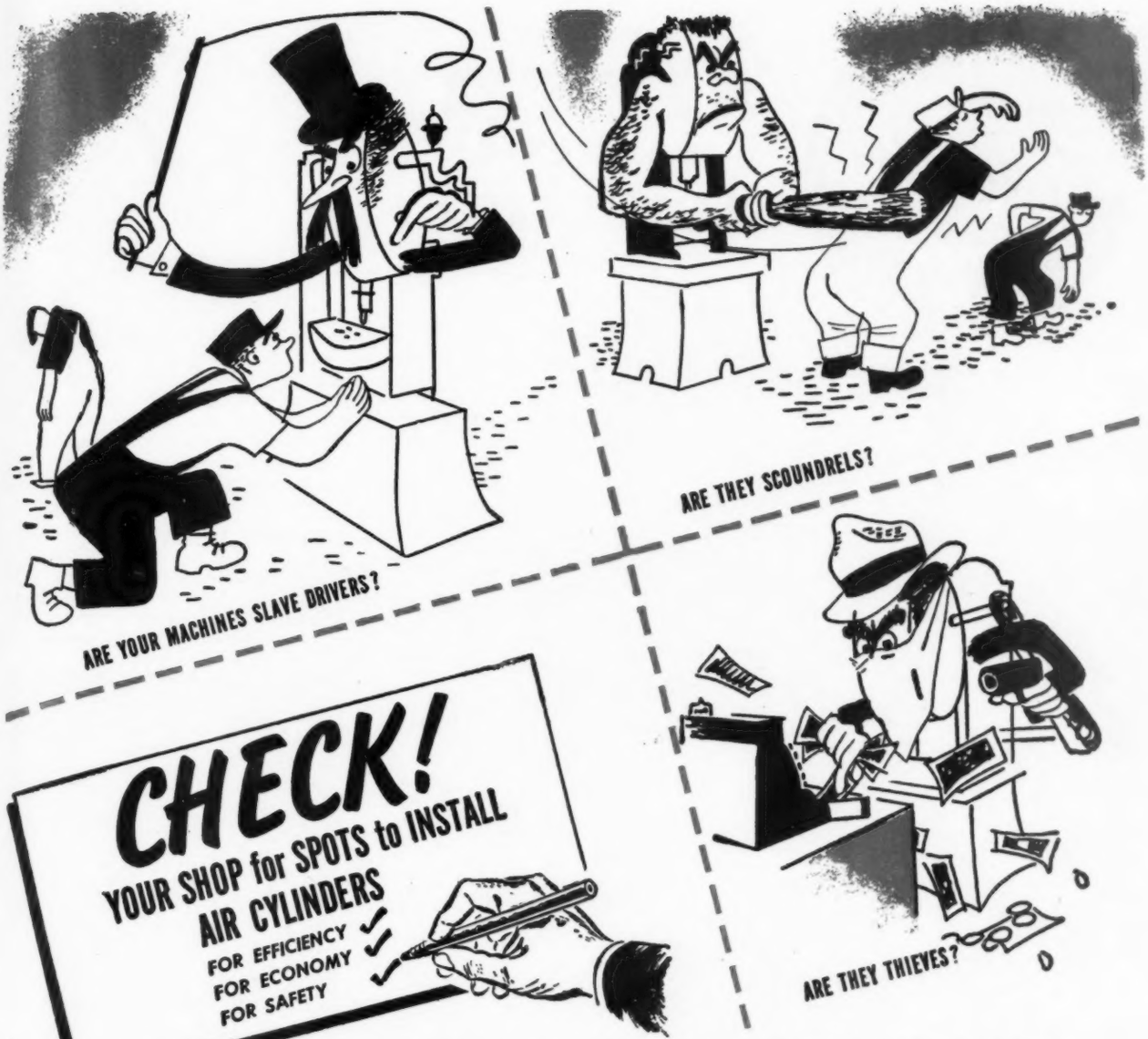
mounted above conveyor, out of the way of dust, dirt, and spillage. Engine mounting is adjustable to keep engine level at all conveyor positions. Unit may also be furnished with an electric motor for use when electricity is available, or it may be obtained without power unit, if desired. Suitable for conveying bulk products such as sand, salt, coal, and gravel. Material Movement Industries, 310 South Michigan Ave., Chicago 4.

CHANGE IN OWNERSHIP

Lovejoy Flexible Coupling Company, Chicago, manufacturer of flexible shaft couplings for transmissions, has acquired the production and sales of the mechanical power transmission department of Ideal Industries, Inc., Sycamore, Ill. These products include variable speed pulleys, adjustable motor bases, Select-O-Speed transmissions, drive sheaves, and V-belts.

DEWPOINT RECORDER

The amount of moisture in a gas is determined automatically and continuously by dewpoint recorder. The instrument is designed for applications where the moisture content of atmospheres and gases must be measured or controlled, such as in checking furnace atmospheres or determining the humidity of gases used in factory production processes. It is a combination of heater, refrigerator, mirror, and gas chamber. The dewpoint temperature recorded can be converted into the moisture content of the gas, if desired. Recorder can be arranged so that it will flash or sound a warning when moisture in gas reaches too



AIR CYLINDERS MAKE HARD WORK EASIER, SAFER!

Pushing and pulling motions and other back breaking labor fatigue your workmen and cause them to let up in safety precautions. Production suffers wherever repetitive heavy lifting must be done manually by operators. Inspect your shop now and you'll find many places to install Schrader compressed air cylinders. Schrader air cylinder and accessory air control equipment save time, money and manpower. Literally thousands of jobs can be done faster and safer with compressed air and without overloading your present air compressors. Get complete information now. Our new Air Cylinder folder A10-6 is chock full of helpful hints. Write for it today.

COMPRESSED AIR CYLINDERS

EVERYTHING FOR EFFICIENT AIR CONTROL

• Air cylinders, Operating Valves 2, 3 and 4-way (hand, foot and remote control), Safety and Operating Controls, Air Ejection (Knock-out) sets, Pneumatic Machine Controls (all types), Quick Acting Couplers, Blow Guns, Air Hose and Fittings Hydraulic Gauges.

100th ANNIVERSARY • 1844 • 1946

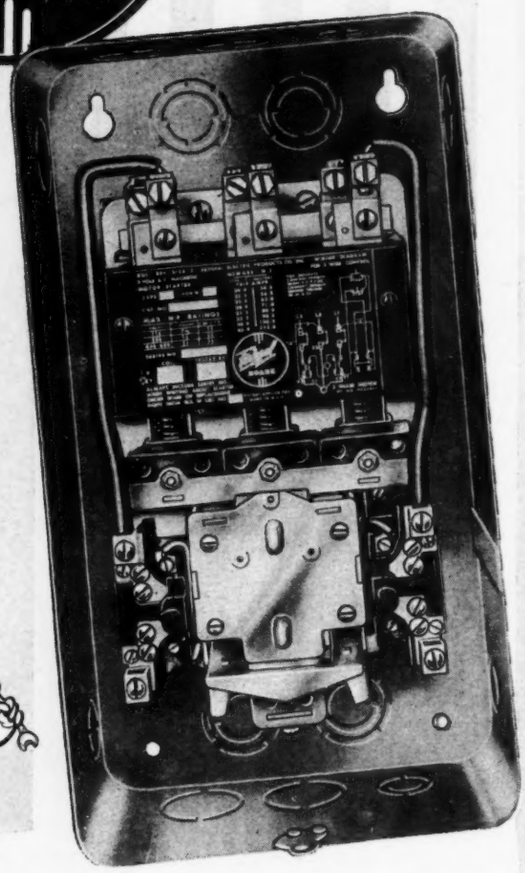
A. SCHRADER'S SON,
Division of
Scovill Manufacturing Company, Incorporated
BROOKLYN 17, N. Y.

Schrader
CONTROLS THE AIR

Bring us your air problems—a corps of engineers at your service

Federal
NOARK

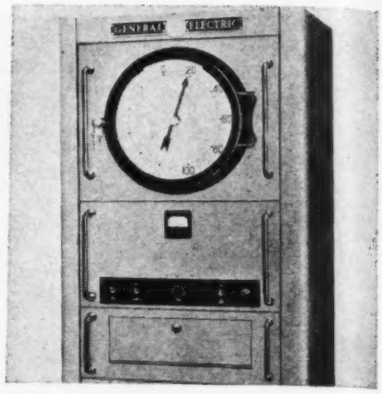
SIZE 3
MAGNETIC
MOTOR STARTER



For man-size jobs of stop-and-go
Without a bit of care or woe
This starter really fills the bill . . .
A fine example of Federal's skill!

Sets a new standard of ease and speed in replacement of any stationary or moveable contacts. Coil replacement in a few seconds without disturbing line or load connections. Greater compactness, yet more ample wiring space. Silver contacts on all current interrupting points. Exclusive vertical ball-bearing operation for highest speed solenoid action. Overload relays, combination hand or automatic reset, for dependable protection.

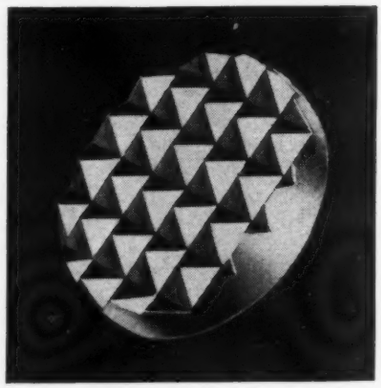
FEDERAL ELECTRIC PRODUCTS COMPANY, INC.
EXECUTIVE OFFICES: 50 PARIS ST., NEWARK 5, N. J. PLANTS: HARTFORD, CONN. NEWARK, N. J.



high or too low a level, or control other equipment which will dehumidify or add moisture to the gas. The instrument is for operation at atmospheric pressure over a dewpoint range from ambient to minus 90 deg. F. General Electric Co., Schenectady.

GRIPPING INSERTS

Line of Kengrips, for use as gripping inserts in various holding, clamping, and feeding devices, is made of solid Kennametal, in the forms of disks and squares



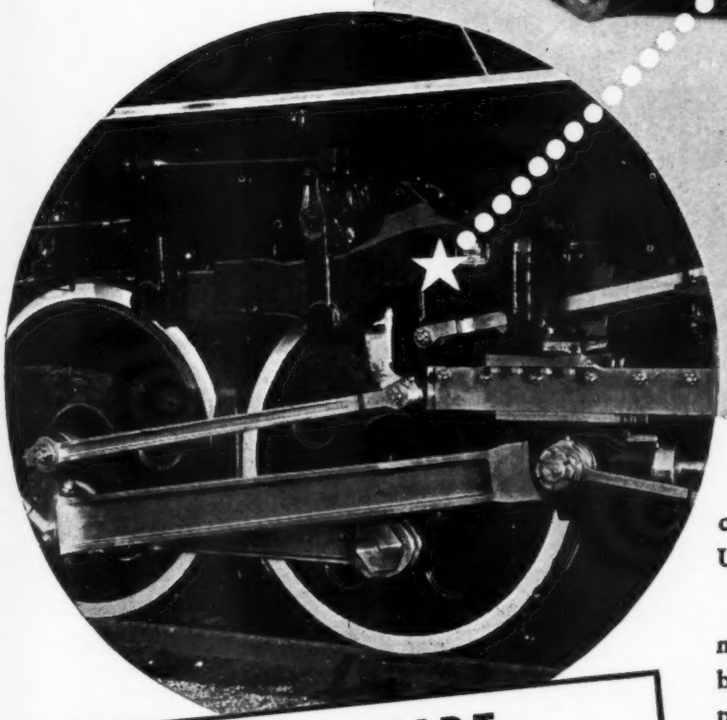
with diamond serrated surfaces. Four sizes are available in either form—$\frac{1}{4}$x$\frac{1}{4}$, $\frac{3}{4}$x$\frac{1}{4}$, $\frac{3}{4}$x5/32, and 1x5/32 inch thick. Kennametal Inc., Latrobe, Pa.

EXPENDABLE PALLET

The cost of X-P pallets is so low, maker says, that they can be discarded after a single trip. Reduction in weight is effected in the 4-way pallet by using a

Plenty of Guts for Speed and Safety in UNITCASTINGS FOR RAILROADS

OSCILLATOR FRAME produced by Unitcast is used on the mightiest of modern locomotives. Average life of casting is 20 years. Weighs approximately 700 lbs. Withstands wear-and-tear of 800 oscillations per minute of gear connecting rod at 90 m.p.h. On test runs, 1760 oscillations per minute.



Tremendous stamina is a "must" in steel castings for these giants of the rails... and Unitcastings "have what it takes!"

For heavy duty work in transportation and many other fields... Unitcastings do the job better and with long-life economy! They're produced with automatically controlled *accuracy and uniformity*... every step of the way to the finished casting. This means fewer rejects ... less machining... and lower cost in the finished product. Specify Unitcastings—write today concerning your requirements. Unitcast Corporation, Toledo, Ohio.

CHECK CHART

Send us this information with blueprints to get Unitcastings "geared to the job".

1—The end use of the casting.

2—Will it be welded to component part or frame?

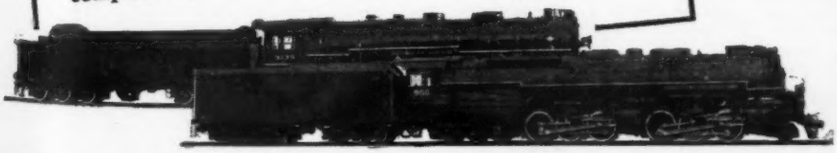
3—Physical properties.

4—Subsequent heat treating.

5—Mechanical tolerances.

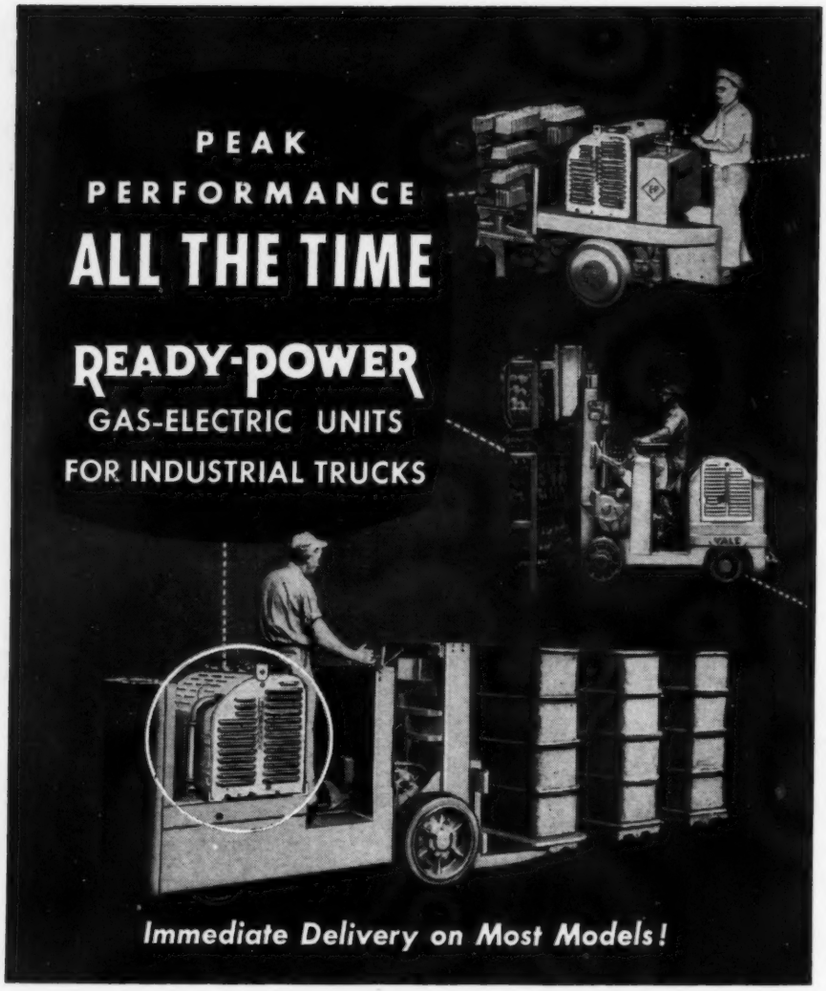
6—Processing of casting in your shop before assembly.

7—Estimated quantity at one time and total quantity.



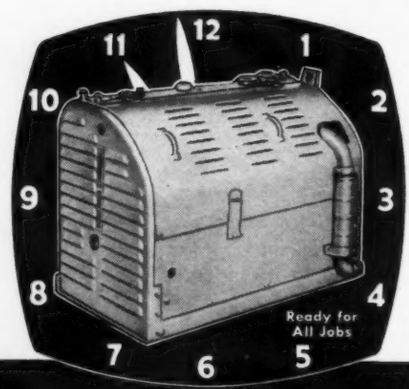
UNITCAST CORPORATION

ALLOY AND CARBON ELECTRIC STEEL CASTINGS



READY-POWER increases the work output of Electric trucks ¼ to ½ over any other form of truck power. Electric Trucks, WITH READY-POWER, operate at the lowest cost . . . are the most efficient and longest lived of any materials handling equipment. There are no costly slow-downs or "downtimes". With READY-POWER you get higher peak performance from your electric trucks . . . more production . . . more materials moved.

Specify READY-POWER on new truck purchases. Convert present trucks to READY-POWER.



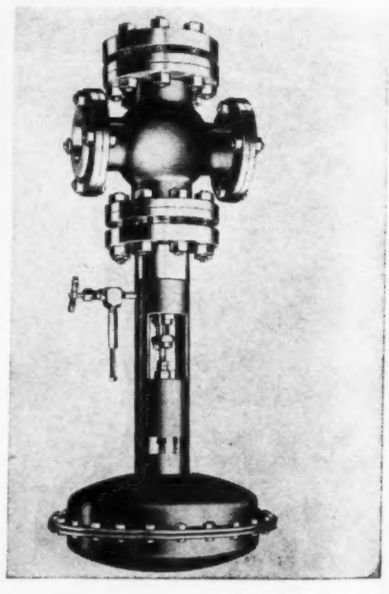
THE READY-POWER CO.

3820 Grand River Ave. - Detroit 8, Mich.

double corrugated board top supported on square or round wood blocks. Entire top and block ends are dipped in a water-resistant adhesive, which seals off moisture from the load. Pallet has 4000-lb. capacity, and is claimed to survive a number of trips without appreciable damage under normal conditions of shipment by rail or truck. Maximum load stowage is attained in the standard 42x48-in. size. Other sizes and double-faced pallets are available with block spacings to suit lift equipment. Techtmann Industries, 714 West Wisconsin Ave., Milwaukee 1.

DIAPHRAGM CONTROL VALVES

Line of diaphragm control valves is made in sizes ½ to 1 inch in alloy construction, either in 304 or 316 stainless steel, or other special corrosion-resistant alloys obtainable in cast form. Single body casting used for each size is rated at 600-lb. maximum working pressure at 750 deg. F. Split flanges give a Van Stone type of joint for ASA pressure ratings of 150, 300, or 600



pounds. Valves may be changed from point to point for use at different pressure ratings by replacing the removable flanges. The valves incorporate all-steel diaphragm superstructure with 2-ply Neoprene diaphragm, valve position indicator, through-bolted stuffing glands, and stuffing box lubricator and isolating valve. The standard air pressure operating range is 2-15 p.s.i.; other ranges are available. For high temperature service, airfin bonnets can be supplied. Hammel-Dahl Co., 243 Richmond St., Providence 3, R. I.

INSULATION TESTER

Designated the Billionaire to indicate insulation resistance range up to 10 billion ohms, insulation tester includes a vacuum tube voltmeter, ohmmeter, and capacity-meter, covering 29 measurement ranges. Eight inches over-all, it is engineered for accuracy to 2 percent at full scale. Auto-

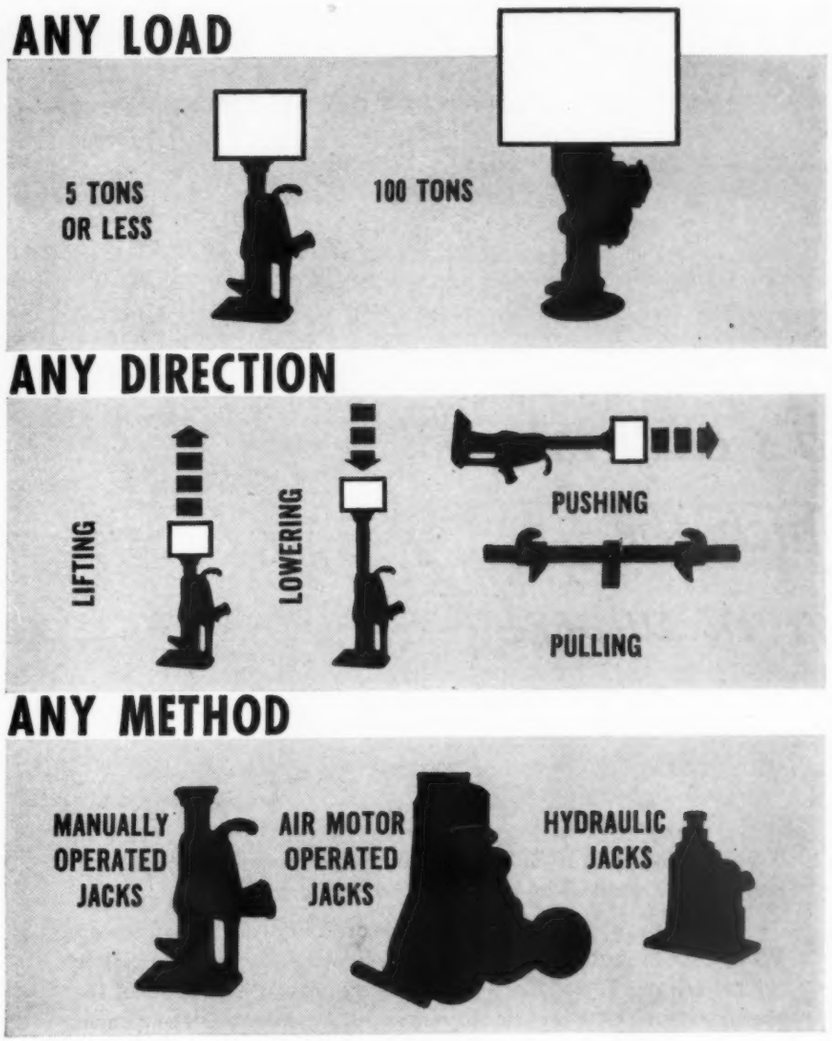
matic line voltage check provides a.c. as well as d.c. regulation for accuracy and stability. An automatic ohmmeter battery check maintains accuracy of low range ohmmeter by indicating when to replace the battery. Instrument ranges from 1 to 10,000 megohms at 500 volts, for insulation testing; vacuum tube ohmmeter, direct reading, seven ranges from 0.1 ohm to 1000 megohms; capacity meter—measurements in eight ranges from 0.0000025 to 2000 mfd.; a.c. vacuum tube voltmeter —direct reading—input capacity 0.00005 mfd. at terminals of instrument. Radio City Products Co., Inc., 127 West 26 St., New York.

FLOOR CLEANER

Neutralave, a floor cleaner for tile and composition floors, is now on the market. It contains a synthetic wetting agent for penetrating dirt, a spreader for high coverage, a lime solvent that elminates haze, and a new ratio of vegetable soaps, maker says. The DuBois Co., 1120 West Front St., Cincinnati 3.

GRINDER

Compact grinder can be set on a bench, hung from a hook, or suspended from operator's belt. Made in three sizes for light, medium, and high-speed work for grinding, burring, filing, sanding, or polishing. Model 00-U, ¼-hp. motor, Model 000-U2, 1/12-hp., and Model 000-U1, 1/18-

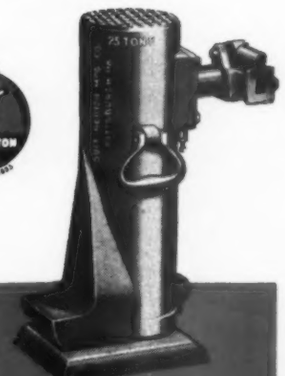


There's a wide range of

Duff-Norton Jacks

to meet YOUR requirements

No matter what the job may be, there is a Duff-Norton Jack to supply the "mechanical muscles." From the wide Duff-Norton line, you'll find Jacks of all types, sizes and capacities —each one easy to operate, safe and dependable. Check your industrial distributor today. Descriptive bulletin on request.



THE DUFF-NORTON MANUFACTURING COMPANY
PITTSBURGH, PA.
Canadian Plant: COATICOOK, QUEBEC

There is a distributor near you

BLINDFOLDED

it's easy to pick the right wiper!

Try the blindfold test on KEX Industrial Wiping Towels and ordinary rags or waste. Just by touch, choose the wiper *you* would use.

Feel how rough and scratchy the ordinary rags and waste are. What a lot of damage *they'd* do on delicate surfaces! Now pick up a KEX Wiping Towel. Easy to tell the difference, isn't it? Feel that springy KEX s-o-f-t-n-e-s-s. No scratching, no possibility of wearing grooves in soft metal by foreign matter.

That's not all, though. Every square inch of a KEX Wiping Towel is *wiping* surface . . . hundreds of more wipes per pound over ordinary waste or rags. KEX Industrial Wiping Towels are uniform in size—distribution is easier to control. And fresh KEX Wiping Towels—chemically cleaned by a *special* high-heat process—are delivered to your plant as often as needed. Always plenty of clean KEX Wiping Towels on hand.

Rent KEX Wiping Towels and Figure Your Profits

Try the KEX Wiping Towel Rental System, today. There's nothing to buy, no expensive inventory—just a low monthly rental. And the very first month should show considerable saving on wiping costs. For complete information, phone your local KEX representative—or write KEX National Service, 295 Fifth Ave., New York 16, N.Y.

"KEX" NATIONAL SERVICE
REG. U.S. PAT. OFF.
"KEX" REG. U.S. PAT. OFF. NATIONAL SERVICE A CALLAWAY MILLS PRODUCT INDUSTRIAL WIPING CLOTHS

hp. Motors, of the universal a.c.-d.c. type, have toggle switch in base and rubber cord and plug. Flexible shafts have the Wyco patented casing, oil-proof synthetic rubber covered and lined with non-metallic graphite impregnated innerliner. Handpieces are cool running, ball bearing, with $\frac{1}{8}$- and $\frac{1}{4}$-in. collets. Model 00-U is suitable for diemaking, and can be used with a tool post holder for light grinding in the lathe. Wyzenbeek & Staff, Inc., 838 West Hubbard St., Chicago 22.

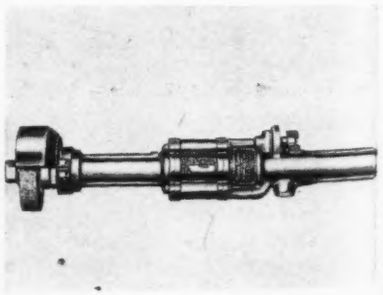
HYDRAULIC JACK

Liftmaster Nu-Hydro jack features base of forged steel, engineered to eliminate leakage through porous castings, and to reduce breakage. Pump piston is of tool steel hardened and ground, and pump cup packing is said to provide leak-proof construction. Bronze guide bearing with long bearing surface is used at bottom of precision-ground ram. Ram cap is a steel forging, designed to give maximum load

contact and safety against slippage. Jack has minimum number of drilled holes, simple mechanism, and no cotter keys. It has low starting height, high hydraulic lift and screw extension, is compact and light in weight. Handle is knurled and of interlocking type, portable, and long, to facilitate spotting under the load. Capacity ranges from 3 to 30 tons. The Joyce-Cridland Co., Dayton 3.

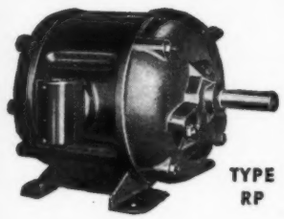
HORIZONTAL GRINDER

Model M-604 straight handle, 4-in. grinder is for general use on steel welds, iron and steel castings and structural work,



Wagner Polyphase Motors

Offer a Wide Choice of Electrical and Mechanical Types



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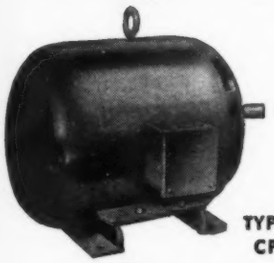
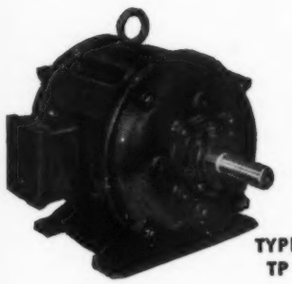


TYPE CP

TYPE HP



TYPE TP

TYPE RS

Fitting the right motor to the job is not always a problem of designing and building a *special* motor, but it is usually one of selecting a standard design of motor which is qualified to give the best account of itself.

Wagner polyphase motors are built in such a wide range of mechanical and electrical types that with few exceptions you can select a standard Wagner polyphase motor that exactly meets the requirements of the job.

SINGLE-SPEED SQUIRREL-CAGE

TYPES	ELECTRICAL CHARACTERISTICS	APPLICATIONS
RP-1, CP-1, HP-1, TP-1.	Normal starting-torque—normal slip	Group or individual drives on machine tools, fans and blowers, compressors, centrifugal pumps—on any application where normal-torque motors are satisfactory.
RP-5, CP-5, HP-5, TP-5.	High starting-torque—normal slip	Crushers, plunger pumps, belt conveyors starting under load, large air compressors, large refrigerating machinery, mixers, and other applications requiring high starting-torque.
RP-6, CP-6, HP-6, TP-6.	High starting-torque—high slip, punch press	Punch presses, shears, metal-drawing machines, balers, and other machinery equipped with flywheels or having flywheel effect.
RP-7, CP-7, HP-7, TP-7.	High starting-torque—high slip, elevator	Elevators, cranes, hoists, dumbwaiters.

TYPES	MECHANICAL CHARACTERISTICS	APPLICATIONS
RP-1, RP-5, RP-6, RP-7.	Open—ventilated	For applications where atmospheric conditions permit use of open-type motors.
CP-1, CP-5, CP-6, CP-7.	Totally-enclosed, fan-cooled	For locations where dust, abrasives, steel chips, filings, acid fumes, moisture, and other harmful elements are present.
TP-1, TP-5, TP-6, TP-7.	Totally-enclosed, nonventilated	
HP-1, HP-5, HP-6, HP-7.	Explosion-proof	For Class I Group D hazardous locations where gasoline, petroleum, naphtha, alcohol, acetone, lacquer, solvent vapors, natural gas, and other flammable liquids are manufactured or handled.

MULTISPEED SQUIRREL-CAGE

TYPES	ELECTRICAL CHARACTERISTICS	APPLICATIONS
MRP-1 to -7, MCP-1 to -7, MHP-1 to -7, MTP-1 to -7.	Two, three, or four speeds, in 3 types: Constant Horsepower, Constant Torque, Variable Torque	For applications involving two, three, or four speeds. Frames varied as listed under "Mechanical Characteristics", and electrically varied as listed under "Electrical Characteristics" shown for single-speed motors above.

WOUND-ROTOR

TYPES	ELECTRICAL CHARACTERISTICS	APPLICATIONS
RS-1	General Purpose Continuous Duty	Conveyors, compressors, pulverizers, etc., requiring continuous operation.
RS-2	Crane & Hoist Intermittent Duty	Elevator, crane, hoist, and like services which operate intermittently.

For complete information on Wagner motors write for Bulletin MU-185, addressing your request to Wagner Electric Corporation, 6412 Plymouth Avenue, St. Louis 14, Missouri.

Send today for your free copy of Bulletin MU-185 which gives complete information on Wagner Single-phase, polyphase, and direct-current motors.

M46-17

LOCKHEED HYDRAULIC BRAKE PARTS and FLUID ... NoRoL ... CoMaX BRAKE LINING

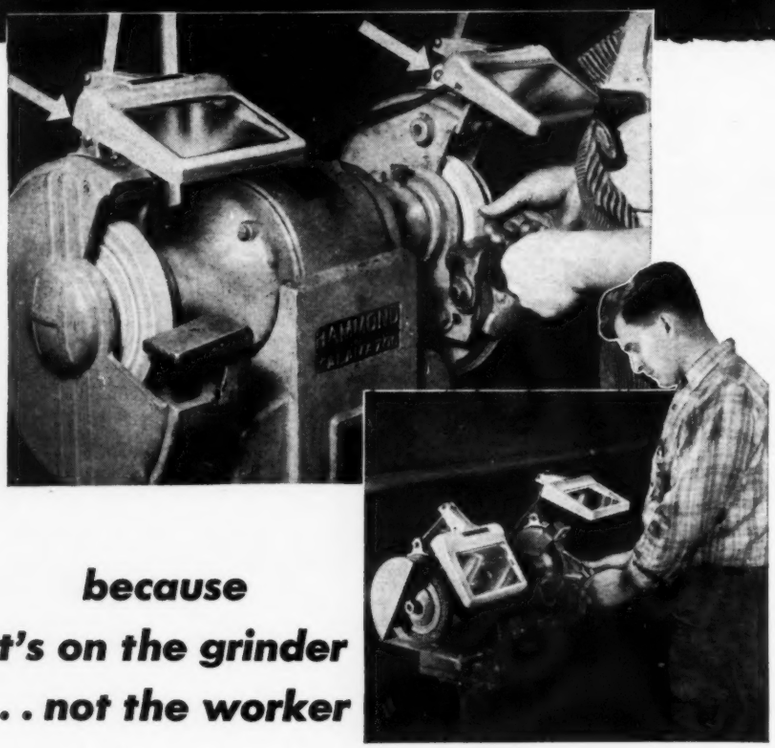
AIR BRAKES ... TACHOGRAPHS ... INDUSTRIAL BRAKES ... ELECTRIC MOTORS ... TRANSFORMERS

Wagner Electric

Sales and Service Branches: ATLANTA 3 • BALTIMORE 16 • BOSTON 15 • BUFFALO 8 • CHICAGO 16 • CINCINNATI 30 • CLEVELAND 15 DALLAS 1 • DENVER 2 • DETROIT 2 • HOUSTON 2 • INDIANAPOLIS 4 • KANSAS CITY 8 • LOS ANGELES 15 • MEMPHIS 3 • MILWAUKEE 2 MINNEAPOLIS 4 • NEW YORK 7 • OMAHA 2 • PHILADELPHIA 8 • PITTSBURGH 13 • PORTLAND 9 • ST. LOUIS 3 • SALT LAKE CITY 1 SAN FRANCISCO 3 • SEATTLE 4 • SYRACUSE 2 • TULSA 3 • WASHINGTON 5 • In Canada: WAGNER ELECTRIC AT LEASIDE, ONTARIO

—Wagner motor parts are available at 250 Wagner-approved and authorized repair shops.

EYE PROTECTION THAT WORKS



because it's on the grinder . . . not the worker

Workers like Stanley "Flud-Lite" Eye Shields. They're the most comfortable kind of eye-protection. Nothing to wear – better visibility. Two bulbs in reflector pour revealing light on every detail of the work – reduce eyestrain – build confidence. Easily adjustable every way except *off-guard.*

Emery dust is kept from scratching safety glass by replaceable window glass. Lights can be connected into grinder circuit to go off when grinder is not operating. Easily attached to wheel guard of bench or pedestal type grinder. Write today for folder. Stanley Electric Tools, New Britain, Connecticut.

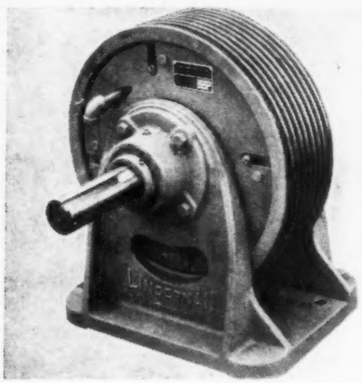
STANLEY
Trade Mark

STANLEY ELECTRIC TOOLS

grinding, buffing, and brushing of metal stampings, and similar applications. Features one-piece spindle, suspended in four bearings, fitted for high speed; large oil reservoir with automatic lubricator; off and on throttle control; internal blade type vibration-less motor; positive governor control for safety; grip handles; and large air strainer. Bearings are sealed against dirt and moisture, and hard chrome is used on main wearing parts. Master Pneumatic Tool Co., Inc., Keith Bldg., Cleveland 2.

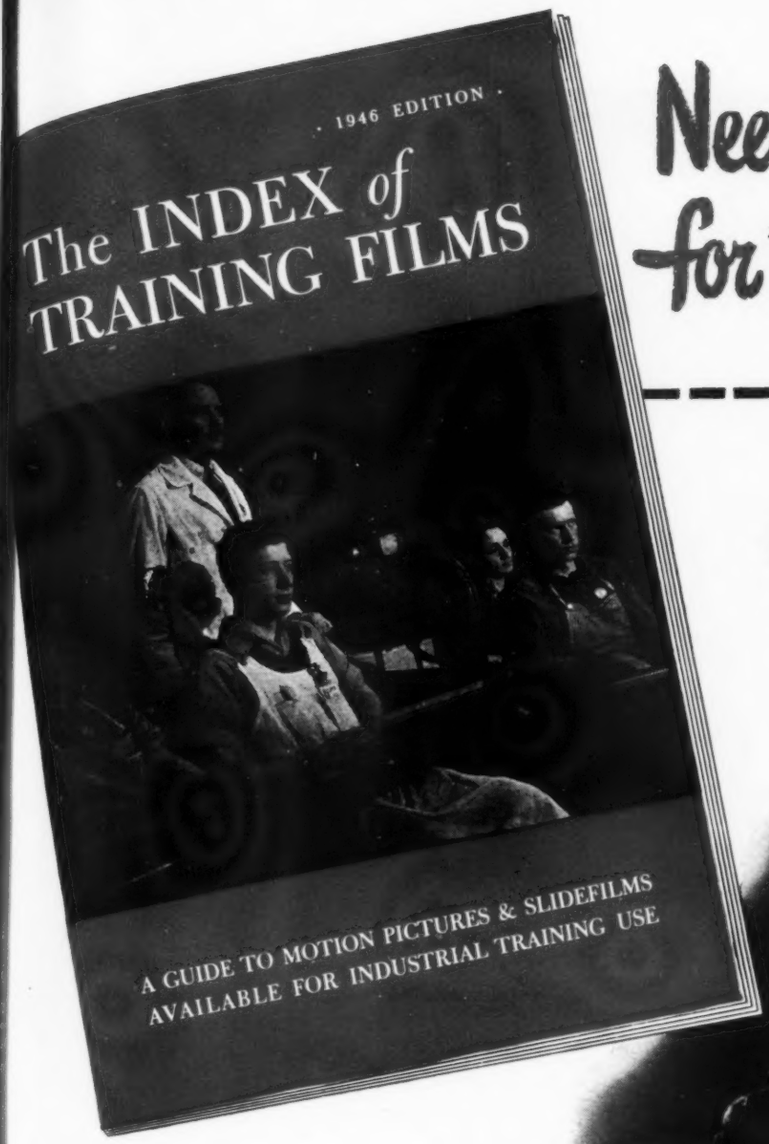
BRAKES

Designed to apply accurately controllable continuous tension in industrial machinery, brakes are available as self-contained units. Features of the brake that are said to make it suitable for applying continuous retarding force are the absence of self-energizing action (permitting accurate control of tension desired); ability to apply even heavy loads under ordinary factory airline pressures; radial shoe actuation, eliminating sensitive adjustments and high pressure areas; use of 90 percent of drum area for braking. Air pressure regulating valve in the lead from factory air line adjusts the tension. Slight increases or decreases in tension are obtained by changing gage setting. Under continuous load 14x4-in. brake absorbs from 3 to 10 horsepower, based on maximum lining temperature of 475 degrees. Brake operates in either direction. Drums are heavily finned to provide maximum heat-dissipation under continuous application. Fan cooling can also be provided. Linderman Devices, Inc., Newburgh, N. Y.



VALVE

Warden valve is made to shut off the flow of any fluid when pressure drops below a predetermined level. The automatic action protects against momentary pressure drops or ruptured pipe lines, to prevent fire, explosions, or other damage. Valves can be installed in gas or oil supply lines for industrial furnaces, or other gas- or oil-using equipment. Each valve is manually set to close at a specified pressure, which can be varied for each installation. When fluid flow drops below this pressure, spring-operated diaphragm drops down



Need more "instructors" for training workers?

This new book lists the best ones in the business . . . 1700 specially made training films you can borrow, rent, or buy

The *"ready-made"* films listed here are available from scores of manufacturers in 25 industries . . . from film distributors and government bureaus. The book tells you where to get them . . . which are free . . . which can be rented or bought and for how much.

It classifies and describes all of these motion picture and slide films accurately . . . so you can quickly select those you need. It includes films on shipbuilding, aviation, electronics, industrial chemistry, and many other fields. It lists films on such special skills as welding, tool dressing, drafting, and the use of precision measuring instruments.

Training Films

—another important function of photography

In fact, when you see how thoroughly these films cover the industrial field, you'll wish the book had been available sooner . . . so, write today for your free copy of "The Index of Training Films."

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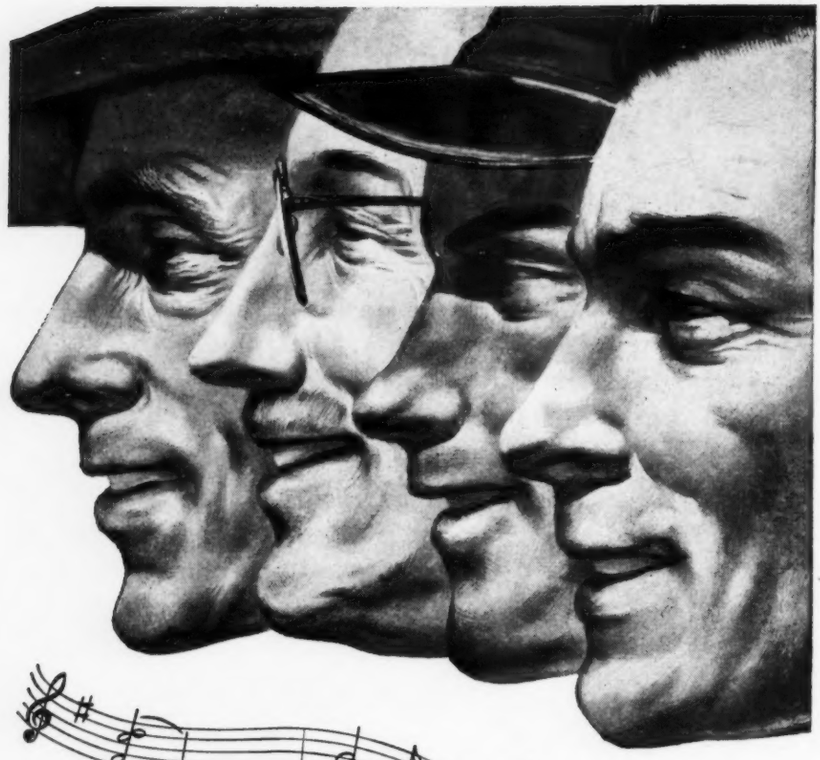

Complete Harmony in Kansas

* It is very true that Kansas meets industry half-way. Kansas' labor is 97% American born, 94% white . . . rural in origin, experienced, intelligent and neither inclined nor susceptible to radicalism. Kansas' business and professional population is wholeheartedly cooperative . . . tax legislation is favorable and labor laws are equitable. Kansas' banks offer every necessary facility. Kansas' farmers are industrious, prosperous and progressive. All in all, it is a harmonious combination that you will enjoy profitably.

these are important, too . . . **Kansas' strategic location means big savings in time and costs for executive and administrative travel. Sales management is nearer to all territories, salesmen nearer the home office. Distribution time is reduced, costs lowered. Consider these with the many other advantages Kansas offers and you have a combination that is hard to beat anywhere.**

You will be interested in the brochure, **Let's Look Into Kansas.** Ask for it on your letterhead.

KANSAS INDUSTRIAL DEVELOPMENT COMMISSION

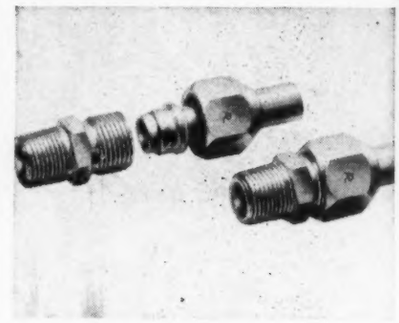
WILLIAM E. LONG, Secretary-Director
813-E Harrison Street, Topeka, Kansas

KANSAS ***REALLY*** *MEETS INDUSTRY HALF WAY*

and trips the valve-closing mechanism. Valve is manually reset by control shaft. Available from 1½ to 8 inches in diameter, valves are all bronze, unless otherwise specified, with Neoprene diaphragm. Self-draining feature provides positive action even with heavy fuels. Security Valve Co., 410 San Fernando Rd., Los Angeles.

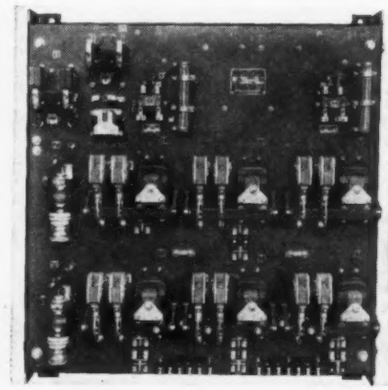
FLARELESS FITTING

Eliminating the need for special flaring and assembly tools, brazing, or soldering, fitting incorporates a steel ferrule which, when body and enclosing nut are tightened up, acts to cut a shoulder in the tubing itself. Maker says this provides a tight sealing grasp for the assembly. Suitable for joining all types of metal tubing, including ¼ hard stainless steel, in hydraulic and fluid-conveying systems, it can be used in high-pressure applications and for thick wall tubing installations. The three fitting units have been provided with a loose fit with the tube size to be used, for ease of assembly, and to permit tube to center itself during make-up to facilitate uniform depth of cut. Made in ⅛- to 1-in. O.D. tube sizes, in standard shapes and materials, the fittings are threaded identically in size and pitch with corresponding flared fitting. The Parker Appliance Co., Cleveland.



MAGNETIC CRANE CONTROL

Controls for operating alternating current cranes from the floor level are actuated from a pendant pushbutton station or from rope-operated master switches. The controllers, for mounting on the trolley or along crane girders, are of the magnetic contactor type with accelerating and speed-limiting functions controlled by frequency



On a milling machine application requiring accuracy within .002, a milling cutter was producing 20 units an hour. A change to an Atkins Curled-Chip Milling Saw on another type machine stepped up output to 500 per hour while rigidly maintaining the required accuracy.

PROOF That It Pays to give Cutting the Once-over

This spectacular increase in cutting speed, (2500%) is exceptional, of course. But it *does* show how a new approach to a problem can result in improved methods, using improved tools . . . to bring about sensational reductions in production costs. It is positive proof that it pays to investigate modern tools like Atkins "Curled-Chip" Saws...to get the full story of these fine saws . . . their greater cutting speed, greater cutting accuracy, longer cutting life.

Check with your distributor today. Ask him to have an Atkins Cutting Engineer arrange an actual demonstration on work you choose.

See Your Industrial Supply Distributor

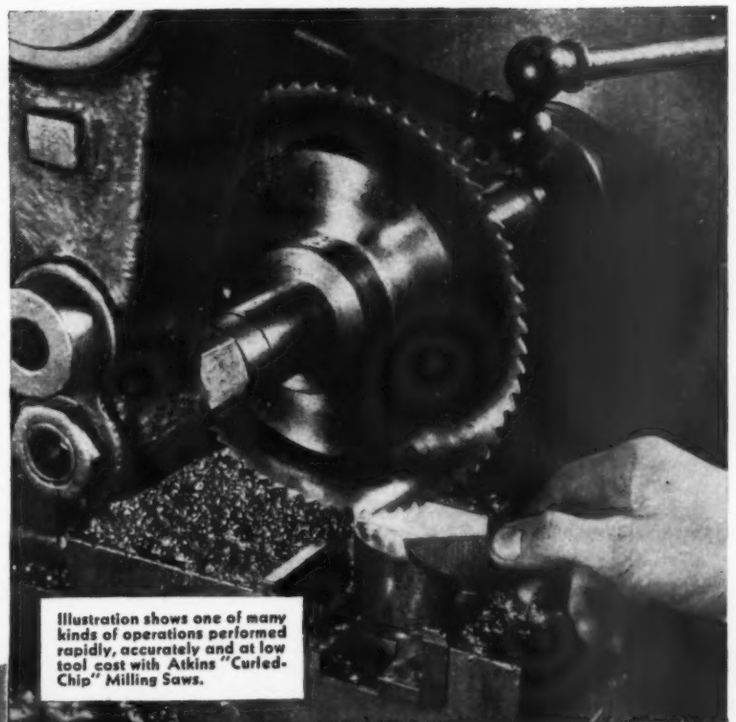


Illustration shows one of many kinds of operations performed rapidly, accurately and at low tool cost with Atkins "Curled-Chip" Milling Saws.

E. C. ATKINS AND COMPANY
Home Office and Factory: 402 S. Illinois St.
Indianapolis 9, Indiana
Branch Factory: Portland, Oregon
Branch Offices: Atlanta Chicago Memphis
New Orleans New York San Francisco

ATKINS

MAKERS OF BETTER SAWS FOR EVERY CUTTING JOB

Power and Hand Blades • Milling Saws • Segmental Cold Saws • Metal Cutting Bands

MILFORD FASTENING EQUIPMENT

Important Memo

for **DESIGN and PRODUCTION ENGINEERS**

With Milford Fastening Equipment, rivets and rivet-setting machines, heavily oversold temporarily, it is foresighted to plan assembly operations while future products are still on the drawing board. Milford will gladly work with you along this line.

MAGNETIC WINDINGS CO.
EASTON, PENNA.

SMASHED ASSEMBLY BOTTLENECK

by fastening this robot bomb part with standard-sized tubular rivets set automatically by machine

Jumped assemblies from 85 to 260 units per hour

BETTER THAN 300% INCREASE

Two small end rivets were depended on to hold permanently together a set of metal plates. Setting these rivets by hand was slow and tedious; delayed a vitally needed part.

But since the rivets were standard-sized, they could be set immediately by a standard machine. The change-over was easy; the production increase inevitable.

To users of Milford Fastening Equipment this is not news. Ever since Milford rivets and rivet-setting machines first fastened metal, wood, fabric or plastic parts together, they have been smashing assembly bottlenecks, often with even greater savings in time and labor costs. Catalog on request.

PLEASE NOTE: Until material becomes regularly available to fill back orders, immediate deliveries are not always possible.

THE MILFORD RIVET & MACHINE CO.
861 Bridgeport Ave. **MILFORD, CONN.**
1004 West River St. **ELYRIA, OHIO**

Inquiries may also be addressed to our subsidiary:
THE PENN RIVET & MACHINE CO., PHILADELPHIA 33, PENNA.
Designers and Manufacturers of: SPECIAL COLD-HEADED PARTS, SPLIT, SEMI-TUBULAR AND DEEP-DRILLED RIVETS; RIVET-SETTING MACHINES, SPECIAL MACHINE SCREWS AND SCREW MACHINE PARTS

relays. The relays operate directly from the secondary circuit of the wound-rotor motor, and their operation is matched to the induced rotor-frequency, which is directly proportional to motor speed. Controller-panels are mounted on vertical angles to facilitate surface mounting against the crane girders. Pivoted at the bottom, panels can be tilted for access to rear-of-panel wiring. Hinge-brackets on side limit angle of tilt. General-purpose or gasketed enclosures are available for all panels. The Electric Controller & Mfg. Co., 2700 East 79 St., Cleveland 4.

HAND LAMP

Designated Big Beam No. 211, portable, weatherproof, electric hand lamp has a single focus adjustment for delivering a spot or spread light—a 1500-ft. beam or localized light. It is powered by two stand-

ard dry-cell batteries with pressure-type connections. Weighing 7 pounds, it can be set down anywhere or clamped in a special hold-down fixture accessory. U-C Lite Mfg. Co., 11 East Hubbard St., Chicago 11.

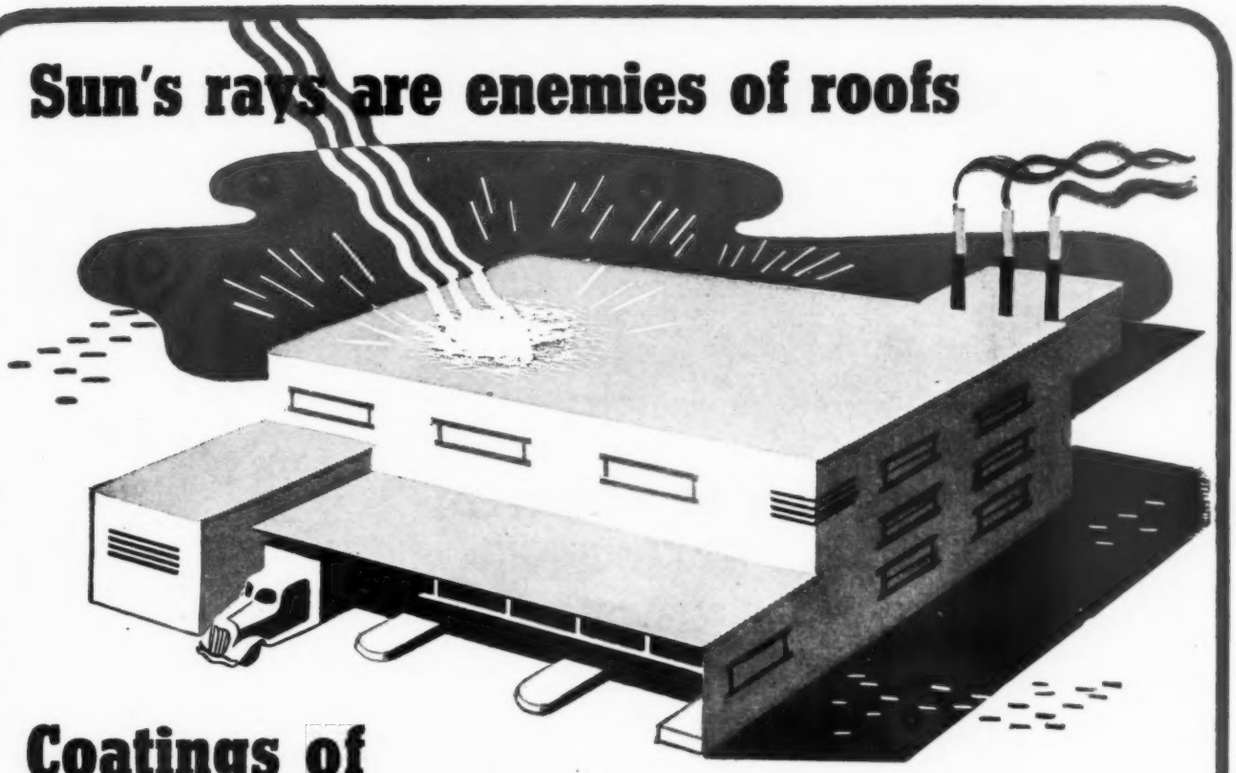
SAFETY FLOORING

Griptred, a non-slip safety flooring and protective covering material for metal, wood, and concrete, is a combination abrasive aggregate and plastic binder. It comes in six colors, and may be applied by trowel, spray gun, or brush. The abrasive aggregate, manufacturer says, will withstand crush loads in excess of 7000 p.s.i. Chemical Products Div., The Goodyear Tire & Rubber Co., Akron.

ELECTRIC-HYDRAULIC PRESS

Electrically operated hydraulic press, called Elec-draulic, is applicable to assembly, straightening, bending, forming, and pressing operations. Supplied in 50- and 75- ton capacities, with all pressures controlled by a fingertip control and release valve. No hand pumping is required. The press features variable ram speed—from 0 to 6 inches per minute—and movable workhead, which can be moved to any point along top channels for off-center work. Any desired pressure can be obtained quickly from the constant-running motor. Dump valve protects press against overload. The frame is rigidly constructed of arc-welded

Sun's rays are enemies of roofs



Coatings of LIQUID ALUMINUM turn them aside

MAINTENANCE COSTS are reduced . . . years of useful life are added . . . "alligatoring" eliminated . . . when bituminous roofs are protected by aluminum coatings made from Reynolds *special* Roof Coat Pigments.

Hot sun rays don't have a chance to reach the roof itself. With aluminum roof coatings thousands of tiny flakes of pure aluminum rise to the surface to form a thin overlapping shield of protective armor that *reflects up to 75% of all light and heat rays* . . . seals out moisture . . . resists corrosion. And the high reflectivity of aluminum roof coatings means lower temperatures *under* the roof and inside the building itself.

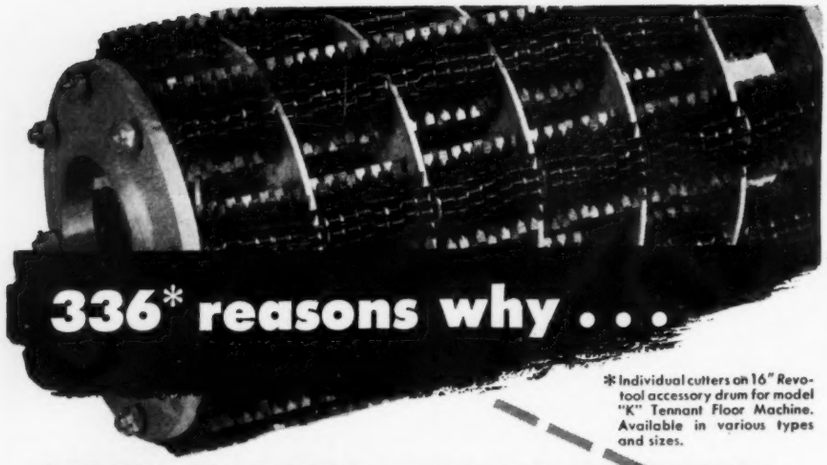
For best results insist on aluminum roof coatings of standard quality, made from Reynolds *special* Roof Coat Pigments formulated only with an approved type of vehicle. These superior pigments are made from purest Reynolds Aluminum foil stock . . . rolled . . . flaked . . . polished for maximum brilliance and reflectivity . . . quality-controlled every step of the way from mine to pigment and backed by a quarter-century's experience.

Write for details. Reynolds technicians will be glad to work with you. Reynolds Metals Co., Pigment Div., 19 E. 47th St., New York 17, N. Y.

REYNOLDS ALUMINUM PIGMENTS

IT'S MORE THAN PAINT...IT'S LIQUID ALUMINUM

503-P6-3A



336* reasons why . . .

*Individual cutters on 16" Revo-tool accessory drum for model "K" Tennant Floor Machine. Available in various types and sizes.

YOUR FLOORS CAN BE CLEANED *FASTER* WITH A TENNANT INDUSTRIAL FLOOR MACHINE

When these alloy steel cutters, mounted on the spinning drum of a Tennant Floor Machine, bite into thick incrusted grime—small wonder it literally *vanishes!* Hardened grease and tar, granite-like cement splashes, thick accumulations of dried paint, chips, metal cuttings—all are sheared from floors by the high speed pulverizing action of the Tennant *Revo*-tool.

REMOVES ALL GRIME IN 1 FAST OPERATION

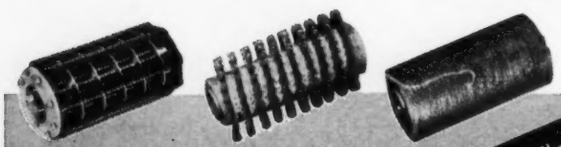
With this rugged, drum-mounted accessory on a powerful, heavy-duty Tennant Industrial Floor Machine, *one man alone* can clean any factory floor in a few minutes.

This operation cuts soilage loose and picks it up at same time . . . leaves floors clean, dry, ready for traffic . . . cuts cleaning costs . . . eliminates need for soap, water, chemicals or scraping . . . doesn't interfere with plant operation.

Available in gas or electric models for 12" or 16" drum accessories.

WRITE TODAY for new illustrated bulletins on Tennant Industrial Floor Machines for heavy industry applications. Specify 12" or 16" accessories; gas or electric power.

G. H. TENNANT CO.
2554 2nd STREET NORTH
MINNEAPOLIS 11, MINNESOTA



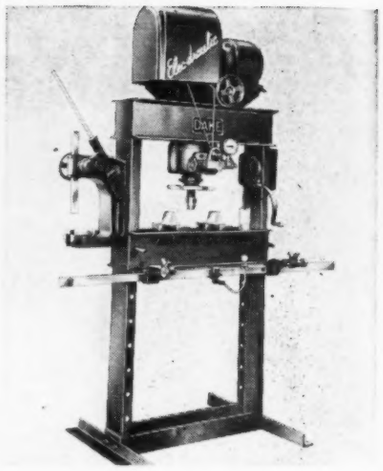
REVO-TOOL attachment pictured above. Ideal for heavy soilage.

WIRE BRUSH, 20, 30 or 39 ga. steel; diagonal pattern, won't clog nor streak.

STEEL WOOL roll for high speed dry cleaning of wood floors.

The way to finer floors TENNANT Floor Maintenance System

Other drum accessories for sanding, polishing, scrubbing.



steel, reinforced throughout. A pressure gage is placed at eye level. Press table height is changed by means of a hoisting crank, and use of the press is speeded by quick-action auxiliary ram return on release of pressure valve. Dake Engine Co., Grand Haven, Mich.

PERCENTAGE TIMER

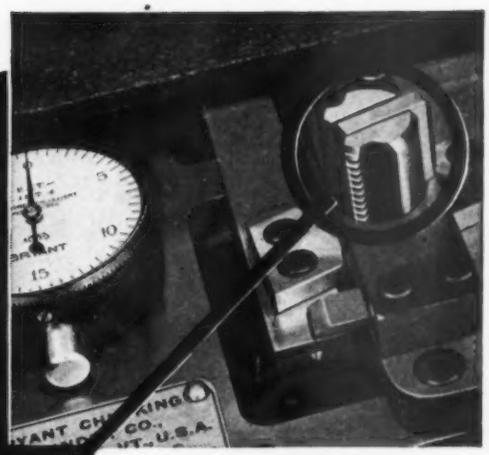
Designed for use on alternating current, instrument automatically controls the percentages of time at which any electrical circuit can be closed or opened out of a definite length of time. Graduations may be in percentage of time or directly translated to feet per minute, gallons per hour,

and degrees of temperature. Calibrations and ranges are adaptable to specific process requirements. Timers repeat within 0.25 percent of any given setting, and motors and operating switch mechanisms are rated for continuous service. Completely enclosed in dust-proof bakelite housings. The R. W. Cramer Co., Centerbrook, Conn.

PRESSURE RELIEF VALVE

Relieving excessive pressures that may take place in fuel and hydraulic lines, valve maintains a predetermined pressure. Can be set to the desired pressure at any time without interrupting its operation, with an outside adjusting screw. This eliminates the necessity for disconnecting either inlet or outlet, and makes possible inspection of the entire valve assembly without disconnecting it from the main line. The

Quality Control made simple ...by the use of BRYANT THREAD GAGES



Internal

External

Quality control — essential to mass production of threaded parts — often slows assembly lines, when time-consuming, conventional gaging methods are used. Yet, inspection can be simple, accurate to any desired tolerance, and extremely fast if you use Bryant Thread Gages. They are easily operated at top speed by anyone. The operator need only squeeze the control lever, drop the part onto the work holder, release the lever. An immediate engagement is made on all the threads. He gives the work a partial turn and the thread is inspected all over. The dial indicator shows the overall accuracy within required tolerances, or accumulated inaccuracies of lead, pitch, diameter and thread form or the presence of burrs. And no "feel for fit" is required and these gages are four-to-five times faster than ring and plug gages.

Do you value quality control in your plant? Then send us part prints covering your problems — our engineers will be glad to advise you. Send the coupon below for Illustrated Catalog G-3.

New Portable Thread Gages, also Squareness of Face Gages, Universal Diameter Size Gages.

Please send me Catalog No. G3 which gives complete details on the Bryant Thread Gages.

Name_____ Title_____

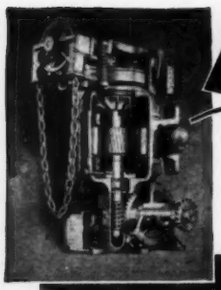
Company_____

Street_____

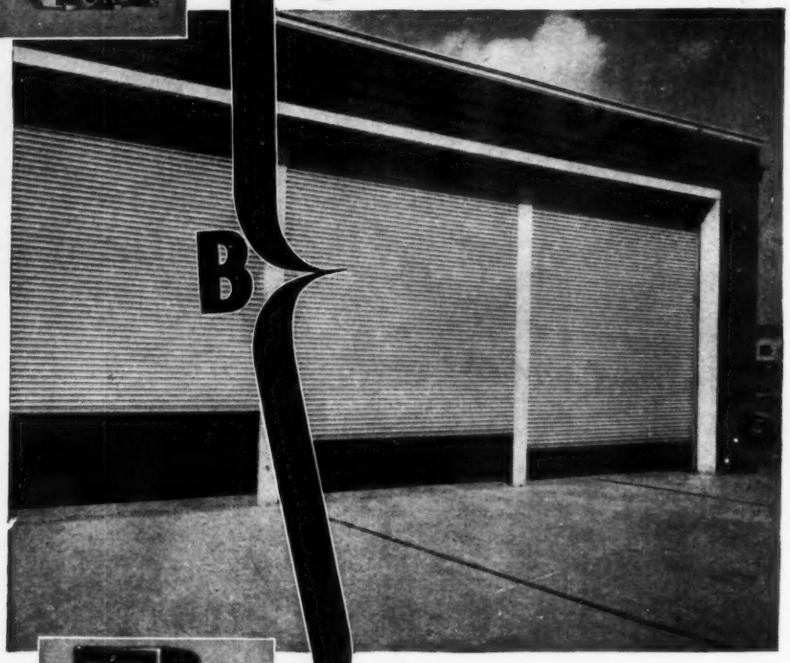
City_____ State_____

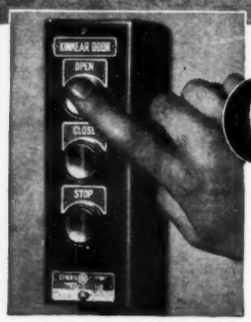
BRYANT

BRYANT CHUCKING GRINDER CO. SPRINGFIELD, VERMONT, U. S. A.



THE ABC's of DOOR EFFICIENCY





A—The Kinnear Motor Operator saves effort, time, and manpower. It goes into action instantly at the touch of a control button—opening, closing, or stopping the door with smooth speed and efficiency. It's a sturdy, integral unit featuring a specially designed torque-output motor, machine-cut gears, and bronze bushings that assure lasting, trouble-free operation.

B—The same bull-dog ruggedness and high operating efficiency are featured in the sturdy, all-steel, interlocking-slat construction of Kinnear Rolling Doors. Coiling into small space above the lintel, Kinnear Doors permit full use of *all* floor and ceiling space around doorways, remaining out of the way and safe from damage when open. These and other basic advantages have made Kinnear a first choice for nearly half a century!

C—Remote Control adds still further convenience and economy by permitting more strategic placing of control buttons, or centralized control stations for any number of doors. It helps eliminate doorway "bottlenecks," and cuts heating and air-conditioning costs by encouraging prompt door closure at all times. Remote control assures maximum advantages from the smooth, easy, time-saving action of Kinnear Motor Operated Rolling Doors.

Write today for complete information on the ABC'S of dependable door satisfaction at its best.

THE KINNEAR MANUFACTURING COMPANY

Factories

1540-60 Fields Avenue — Columbus 16, Ohio
1742 Yosemite Avenue — San Francisco 24, California

Officers and Agents in all Principal Cities

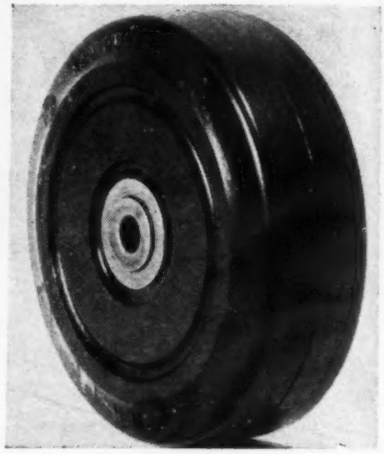
KINNEAR ROLLING DOORS

Saving Ways in Doorways

valves are available for pressures ranging from 5 to 100 p.s.i. in units having individual ranges of approximately 15 p.s.i. Inlet and outlet are in a straight line. Over-all dimensions are length, 2⅞ inches; width, ⅜; and height, 2 inches. Weighs 4 ounces. The Aerotec Co., White Plains, N. Y.

RUBBER WHEEL

All-rubber industrial wheel is constructed with a metal bearing sleeve molded integrally in a hard rubber core in which ball bearings for a choice of axle diameters are mounted. Low power E-Z rolling tread rubber compound is vulcanized to the hard rubber core. Carrying capacity ratings for the wheels are equal to those for vulcanized on tires and metal wheels



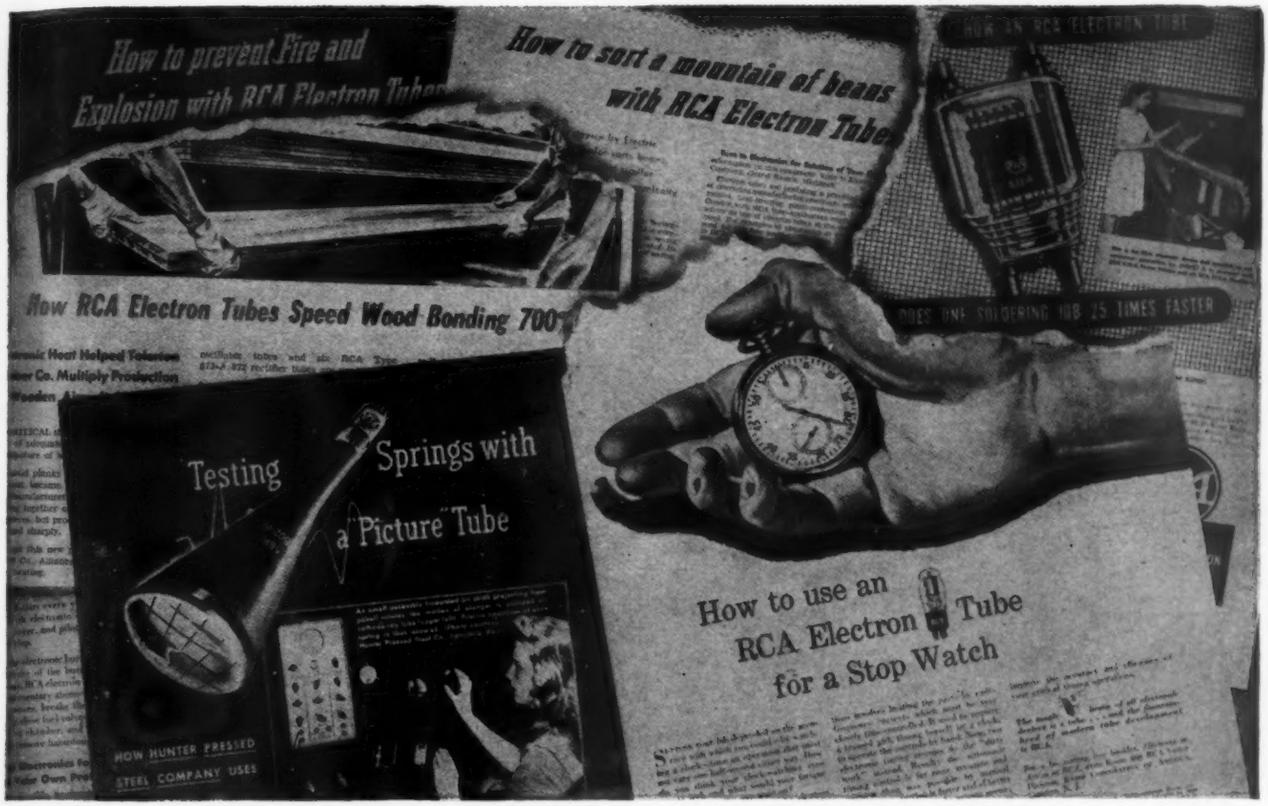
of the same size, but resistance to extreme impact loads is less because hard rubber shatters more readily than cast iron. They are therefore not recommended where extremely rough usage is encountered, but are suitable for use where corrosive agents are present, or where conditions are not favorable to rubber tires vulcanized on to metal wheels. The B. F. Goodrich Co., Akron.

CAR DOOR OPENER

Allowing one man to open or close any boxcar door in a few seconds' time, tool is said to eliminate strained muscles, dangerous slips and falls, mashed fingers, and other personal injuries from binding doors. Known as the Monarch car door opener, it weighs 15 pounds, and is built for the heavy freight yard and shipping platform handling. Industrial Products Co., 2820 North 4 St., Philadelphia 33.

SHOP LIFTER

Complete with floor lock, shop lifter can be used as a die table, lifter and transporter of heavy fixtures, for tiering boxes, raising toteboxes, draining drums, positioning heavy work, installing machine parts, and loading and unloading motor trucks. Lifting platform is cranked up and down, and automatic clutch locks the load in any position. Has cut steel gears, and


How to prevent Fire and Explosion with RCA Electron Tubes
How to sort a mountain of beans with RCA Electron Tube
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How to use an RCA Electron Tube for a Stop Watch

What can Electronics do in your factory?

The chances are there's at least one job it can do better and cheaper

ELECTRONICS is by no means the answer to every industrial problem. The fact is that many jobs are done well enough by other means.

But, electronics is quicker than the eye and hand, is infinitely more observing, and can repeat precision operations indefinitely—and faster—without fatigue. Moreover, electronic power can perform intricate heating and welding jobs in less time than it takes to tell it. Any one of these operations done electronically adds up to a greater production of higher quality products at less cost.

The upshot is that electronics has stepped out of its role as a "blue sky" miracle and become a practical business proposition. If you have not reviewed its possibilities as an industrial tool, now is the time to consider its potentialities.

Electronics can do these jobs for you!

Heating metals, plastics and wood

Timing welding and control operations

Controlling manufacturing and processing operations

Regulating motor speed

Converting alternating current to direct current

Inverting direct current to alternating current and changing the frequency of alternating current

Counting, sorting and weighing manufactured or processed products qualitatively or quantitatively

Inspecting finished products nondestructively

Measuring product specifications

Analyzing product characteristics

Protecting workers against injury

Write for convincing proof

The free booklet ***"16 Examples of RCA Electron Tubes at Work in Industry,"*** will prove convincing. Write for it today on your company letterhead and address your request to Radio Corporation of America, Commercial Engineering Department, Section I-12H, Harrison, New Jersey.

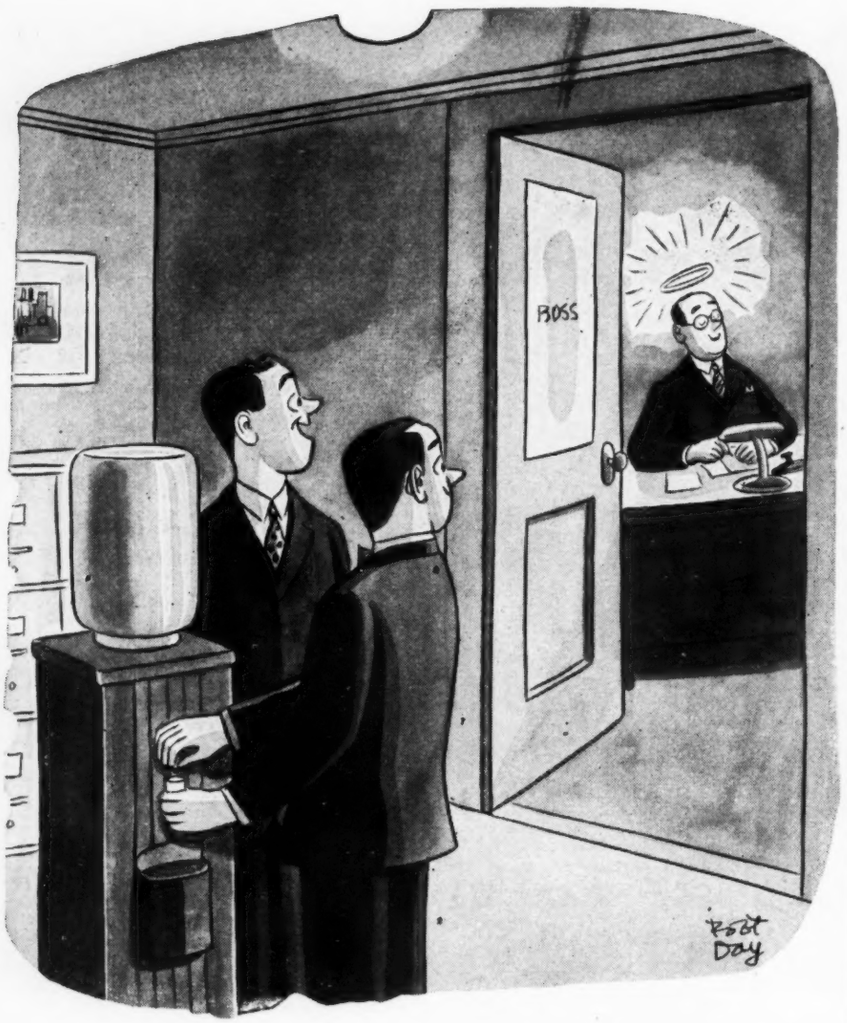
RCA Princeton Laboratories

THE FOUNTAINHEAD OF MODERN TUBE DEVELOPMENT IS RCA

TUBE DEPARTMENT

RADIO CORPORATION of AMERICA

HARRISON, N. J.



"Nobody knows how it happened, but there it was—right after he installed that G-E Water Cooler"

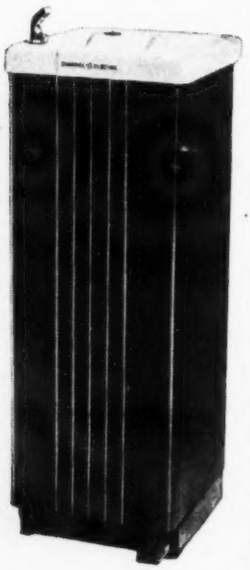
It's so easy to be a good boss

THINGS THAT might *seem* unimportant—a G-E Water Cooler, for instance—make a terrific hit with employees. Cool, refreshing water in a convenient place is mighty good for office morale.

And economy? Man, you can operate one of those G-E coolers at approximately 2¢ a day! Maintenance costs are low. The stainless steel G-E tank is rust-proof and corrosion-proof, for long life. The G-E motor is designed and tested for trouble-free service.

Ask your G-E Dealer to reserve one of these grand water coolers for you. He's listed under "Water Coolers" in your Classified Telephone Directory.

General Electric Company, Air Conditioning Department, Section 6728, Bloomfield, New Jersey.

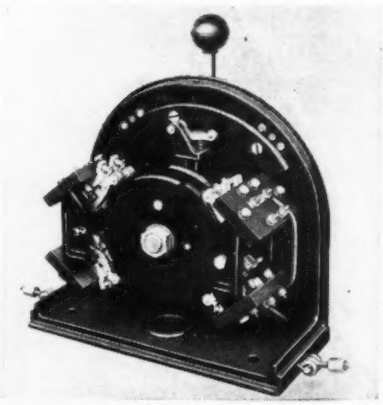


GENERAL ELECTRIC
Water Coolers

lifting carriage is equipped with sealed ball bearings, while guide wheels are of heat-treated steel. Hand crank that raises platform 3 inches with each revolution is removable. The shop lifter has running gear of 4-in. ForgeWeld roller bearing casters. Foot-operated floor lock has molded rubber pad on bottom for floor protection. Over-all height is 6 feet; lift of platform, 4 ft., 8 in. from floor; lowered height of platform, 5½ inches; platform is 24x24 inches, and has capacity of 500 pounds. Service Caster & Truck Div., Domestic Industries, Inc., Somerville, Mass.

MASTER SWITCH

Made for use with mill and crane magnetic controllers, Type CM master switch is announced. The cam-type switch has silver alloy contacts normally spring-closed and opened by 7-in. diameter cams. The large diameter of the cams are saving in motion for the operator, permitting throw



of 37½ degrees for a 6-speed-point switch, and reduces mounting space required when several switches are installed in a mill pulpit or crane cab—8-circuit masters can be mounted on 7⅞-in. centers—facilitating reaching and operating them without changing operator's position. The Electric Controller & Mfg. Co., 2700 East 79th St., Cleveland 4.

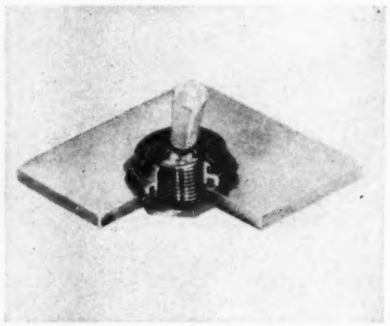
PORTABLE GRINDER

Gaston grinder is a portable tool for grinding and sanding operations on all gages of steel and other metals, and is

stant load-carrying capacity. Timer operates in any position. Any desired time interval up to the limit of the unit may be pre-set, and thereafter the same time cycle will be repeated at each manual resetting, or the stop may be released and desired interval set each time by the graduations on dial. A companion piece to the process timer is the Type A signal indicator, containing both a buzzer and a bright bullseye light. Can be mounted in any position, and is fitted with a male 3-way plug, which connects directly into socket on the timer, or it may be remotely located at any distance by use of a 3-wire cord. Potter & Brumfield Sales Co., Dept. 215, 549 West Washington Blvd., Chicago 6.

SEALING NUT

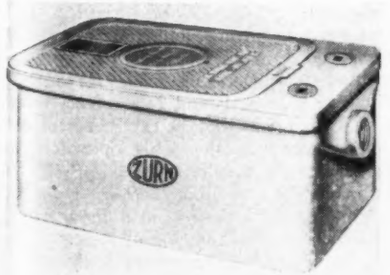
Mounting and sealing nut prevents dirt, water, or gas from entering equipment panels around switch and control shafts. An elastic sleeve tightly grips protruding shaft or switch handle. Base of nut is sealed to panel by internal rubber ring,



which permits metal-to-metal contact between nut and panel, for solid mounting. Applications of the Sealnut include pressurized and moisture-proof equipment, whether operating submerged, at high altitudes, or in any way exposed to the elements, as well as for protecting equipment used in the presence of dusts and corrosive fumes. Radio Frequency Labs., Inc., Boonton, N. J.

GREASE INTERCEPTOR

Low-slung body of grease interceptor permits use on drainage lines of sinks and dishwashers that have low reservoirs and drain connections, or under low-built counter or drainboard installations, without recessing in floor. Unit operates by the flotation principle. Perforated baffle



...one handles the Hydrolectric

...the "other 3" go along for the ride!

THIS is just another way of stating an amazing FACT: *With the Motorized HYDROLectric Lift Truck, ONE operator does the work ordinarily requiring FOUR!* Records prove these trucks cut handling costs up to 75%!

Electrically propelled . . . with patented push-button "Finger Tip Control" . . . the HYDROLectric permits instant forward or reverse action, moves loads 4000 lbs. and more without effort. Actually, the HYDROLectric is so simple a *child* can operate it!

Users—including America's leading industries—report constant 24-hour-a-day service with negligible downtime, pays for itself five or more times in a year. Send now for folder "A", giving full details.

Only the HYDROLectric Offers So Much

- Positive Gear Drive To Load Wheel
- 4 Wheels for Stability
- Costs only 1/3 and weighs only 1/3 of other powered TRUCKS of equal capacity.
- Records up to 21 years of 8 hour day performance.
- Engineered by the Stuebings, Pioneers in Lift Truck Construction since 1910. Patented.

THE RED ARROW THE HYDROMATIC

Easy single or multi-stroke hand lift trucks. Capacities up to 8000 lbs. Users state they pay for themselves 5 to 10 times yearly.

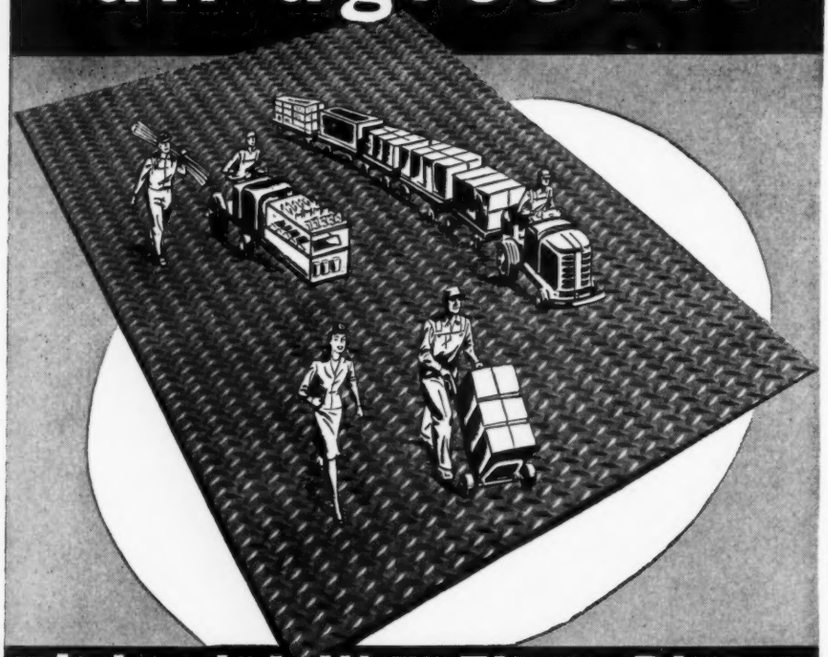
LIFT TRUCKS INC. W.W.W. STUEBING CINCINNATI

LIFT TRUCKS, INC.

Walter Stuebing, *President*

2425 Spring Grove Ave. Cincinnati 14, Ohio

all agree . . .



Inland 4-Way Floor Plate

IS SAFE—ECONOMICAL—EASY TO INSTALL

PLANT MANAGER

PLANT MANAGERS interested in efficient operation and better production appreciate the confidence gained by employees standing or walking on Inland 4-Way Floor Plate. Its safety and fireproof qualities mean less liability while lower original installation and maintenance costs bring added economy.

SAFETY ENGINEER

SAFETY ENGINEERS can breathe a sigh of relief when slippery, dangerous floors are covered with Inland 4-Way Floor Plate. They know that, installed on floors, ramps, walkways, steps, platforms or any place where slips or falls may occur, it provides a safe surface that prevents slipping and falling.

MAINTENANCE ENGINEER

MAINTENANCE ENGINEERS like the way Inland Floor Plate can be installed over all types of worn floors or placed over wooden or steel joists without additional support on original jobs. It's the most rugged flooring they can install . . . sweeps and mops easily, drains freely and can be quickly painted.

PURCHASING AGENT

PURCHASING AGENTS specify Inland 4-Way Floor Plate because it is promptly available from conveniently located warehouse distributors in ¾" to 16 gauge thicknesses, does a better job, and everyone from plant manager on down gets the best results.

Write for your copy of the Inland 4-Way Floor Plate Catalog—samples are available upon request.
Inland Steel Co., 38 So. Dearborn Street, Chicago 3, Ill.
Sales Offices: Cincinnati, Detroit, Indianapolis, Kansas City, Milwaukee, New York, St. Louis, St. Paul.

INLAND STEEL

INLAND STEEL COMPANY

PRINCIPAL PRODUCTS: BARS • STRUCTURALS • PLATES • SHEETS • STRIP • TIN PLATE
FLOOR PLATE • PILING • REINFORCING BARS • RAILS • TRACK ACCESSORIES

plates eliminate turbulence in the water as it enters interceptor, permitting the grease to separate from the water. Intercepting chamber is an integral unit which can be removed for cleaning. The assemblies are made in cast iron or stainless steel, according to requirements, and can be supplied with anchorage flange or seepage pan. J. A. Zurn Mfg. Co., Erie, Pa.

MOTOR-GENERATOR CHARGER

Automatic charging equipment is designed to charge 6-cell lead-acid batteries in 8 hours and 10-cell nickel-alkaline batteries in 7 hours, in motorized lift trucks. The Model H unit consists of a motor-generator set on which are mounted the necessary controls and control panel. Batteries

charged range from 250- to 550-amp. hours for lead-acid type, and from 225- to 450-amp. hours for the nickel-alkaline type. Standard models are designed for 220/440- or 500-volt, 2- or 3-phase 60-cycle a.c., but units can be supplied for practically any current requirement. The Hertner Electric Co., 12694 Elmwood Ave., Cleveland.

MAGNESIUM DOCK BOARDS

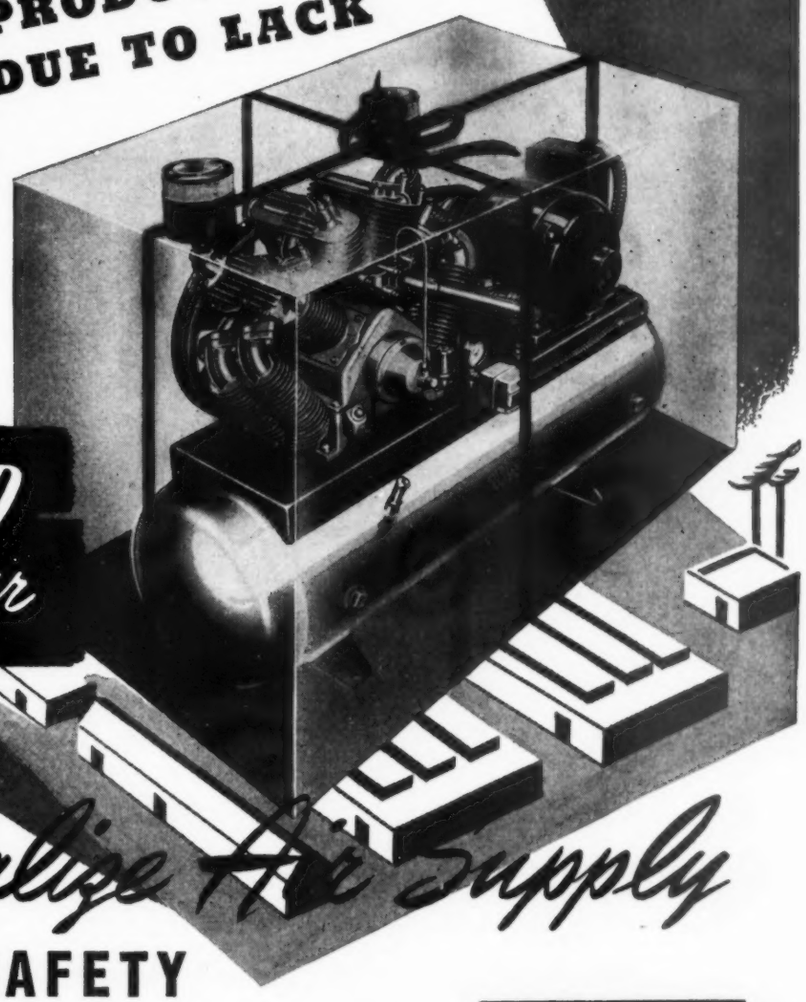
Loading operations involving several freight cars are said to be materially speeded by using portable dock boards of magnesium, with 1600-lb. capacity. Weighing 77 pounds, they can be shifted in place by one man. The boards measure 42x66 inches, are built of ¼-in. magnesium plate, reinforced with 2-in. I sections with side pieces of 3-in. channels, and are of all-welded construction. Edw. S. Christiansen Co., Burnham Bldg., Chicago.

BELT SPLICERS

Developed to provide an accurate, fast method for cutting and punching belts for air-conditioning and generating equipment, belt splicers are made for use on 2-in. cog V-belts, 1- and 2-in. solid V-belts, and 4- and 5-in. flat belts. Belts are cut and punched in the same operation, to match standard splice fittings. Provision is made for handling various types of splice-fittings by the use of different types of punches. The 2-in. V-belt splicer types are equipped with auxiliary knife which

THE WAYNE AUXILIARY UNIT PLAN

Insurance AGAINST PRODUCTION FAILURE DUE TO LACK OF AIR . .



PACKAGED Units of Power

Decentralize Air Supply

FOR SAFETY

PROTECT your plant against possibility of total production stoppage due to air failure. Install Wayne compressors in the departments needing air and it's available even if the central unit breaks down. There are many other advantages . . . shorter pipe lines, higher pressures for special uses and greater operating economy when a few departments work overtime. Write today for interesting booklet, "The Wayne Auxiliary Unit Plan."

for your protection

THE WAYNE PUMP CO., FORT WAYNE 4, IND.

INDUSTRIAL AIR COMPRESSORS

LITE • HOSE REELS • POWER WASHERS • BULK GASOLINE PUMPS

HERE'S THE PORTABLE SAW THAT SAVES TIME AND LABOR ON CUT-OFF JOBS

. . . a handy tool for you

Wells No. 8

Specifications

CAPACITY: Rectangular	8" x 16"
(Special Guides)	5" x 24"
ROUNDS:	8" Diameter
MOTOR:	½ H. P., A. C. or D. C.
SPEEDS:	Selective 60, 90, 130 feet per min.
WEIGHT:	Approximately 665 pounds

All around the plant you'll see them —stock room, tool room, machine shop, maintenance dept.—wherever there is cutting to be done. Write for bulletin—or ask for a representative to call and give you the details on the low-cost Wells.

Wells

Products by Wells are Practical

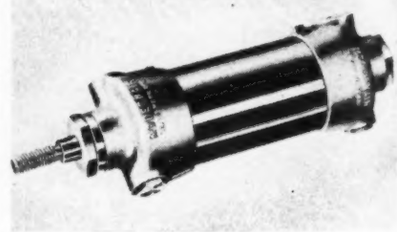
METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
1414 TAYLOR ST., THREE RIVERS, MICHIGAN

grooves solid belts to permit entrance of splice-fitting lip. Flat-belt splicer is equipped for handling various bolt arrangements. A simple change in tool permits splicing 2-, 3-, or 4-bolt coupling assemblies with same unit. Paxton-Mitchell Co., Omaha.

CUSHION-TYPE CYLINDERS

Interchangeable mountings in cushion-type cylinders permit a diversified use of the units. The basic cylinder has no tie rods, and is said to require less space for installation. Cylinder caps are heat-treated aluminum alloy sand castings with high tensile and bursting strength, and design



permits them to rotate 360 degrees on cylinder without disturbing seal. No metal-to-metal contact exists at any point of wear. Cylinder is renewed by replacing "O" rings. Unit is corrosion resistant, and may be used for actuation by air, water, or oil. Modernair Corp., 4222 Hollis St., Oakland 8, Calif.

AIR CIRCULATOR

Strato-Liminator is claimed to create a constant flow of natural air in warm weather, without a direct draft. The air, diffused through the louvers of the unit, circulates to all parts of the room, effecting lower temperature throughout. In cold weather temperatures vary within minimum ranges. Heated air rises, and the circulator, attached to ceiling, draws in the wasted heated air, disseminating it evenly to all parts of the room. Operation of the 36-in. diameter fan is controlled by a thermostat. When the temperature at ceiling level rises above normal, the

NOW . . .

A BULLARD CUT MASTER V.T.L. PUTS SPEED CHANGES AT YOUR FINGERTIPS

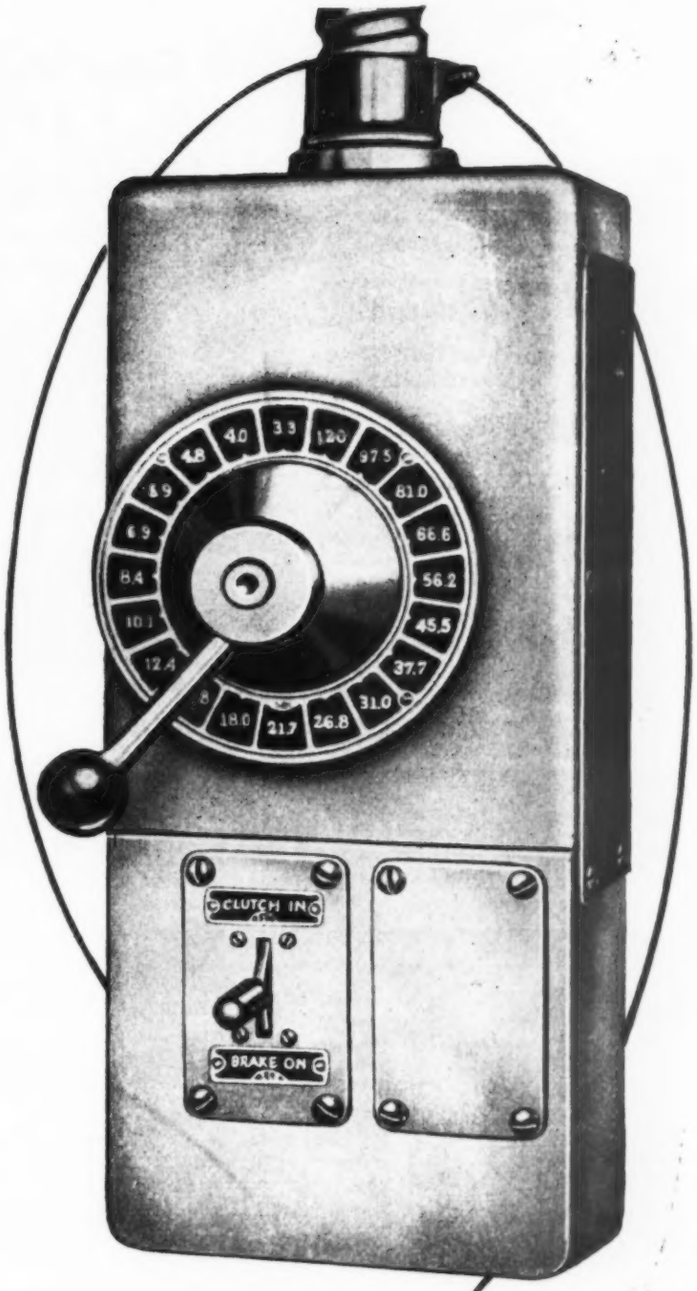
New Pendant Control with Speed Dial and Clutch-Brake Lever Located Where You Want Them

The addition of this entirely new and different Pendant Control to all Bullard Cut Master Vertical Turret Lathes provides a high degree of control and operating efficiency not found in other machine tools.

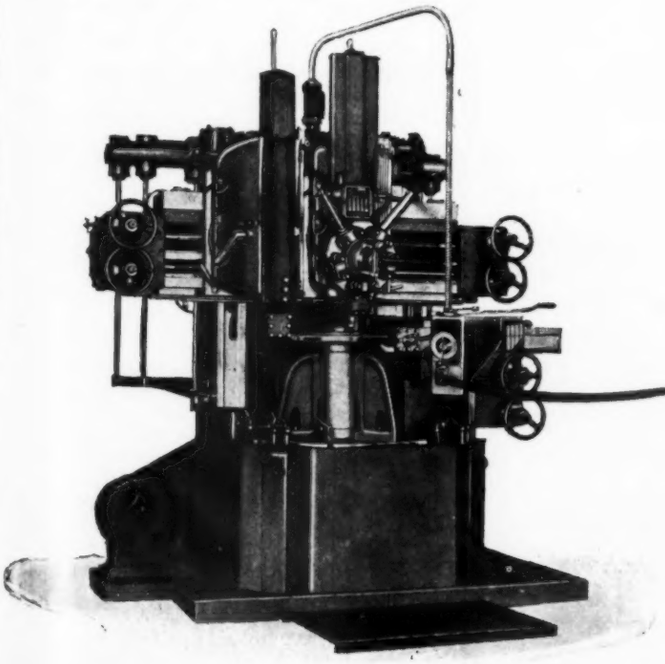
This is how the Bullard Pendant Control works. With the machine operating and a speed change needed, you throw the switch lever to "BRAKE ON" . . . rapidly dial the new speed (an exclusive Bullard Pendant Control feature) . . . throw the lever to "CLUTCH IN". That's all! . . . gears are quietly and almost instantaneously shifted through electrically-controlled, hydraulically-operated mechanisms. When you want to jog the table any fraction of a revolution for positioning or indicating, you merely manipulate the single switch lever.

This new Pendant Control is suspended at the most convenient operating height. It swings in an arc to whatever position is required for ease of operation.

For facts about other features that make Bullard Cut Masters your best investment *for cutting time on and between cuts*, write for Bulletin CVTL-4-1, today. The Bullard Company, Bridgeport 2, Connecticut.



This unique Pendant Control is now a standard specification on all Bullard Cut Master Vertical Turret Lathes which are available in 30" and 36" sizes with two heads . . . in 42", 54", 64" and 74" sizes with two or three heads.



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TO MAKE MACHINES DO MORE

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LOW FIRST COST

LOW UPKEEP COST

GEARING INTEGRAL WITH MOTOR!

TWO SIZES . . . 5,000 LBS. CAPACITY
10,000 LBS. CAPACITY

AVAILABLE FROM STOCK

Powerful, compact, dirtproof, waterproof, foolproof! Equipped with SILENT HOIST totally enclosed worm gear reduction. Pulls and spots cars with ease. Standardization and mass manufacture make low price possible. Workmanship and materials guaranteed without reservation.

Write for prices and illustrated Bulletin No. 64 giving details and specifications.

Silent Hoist & Crane Co.

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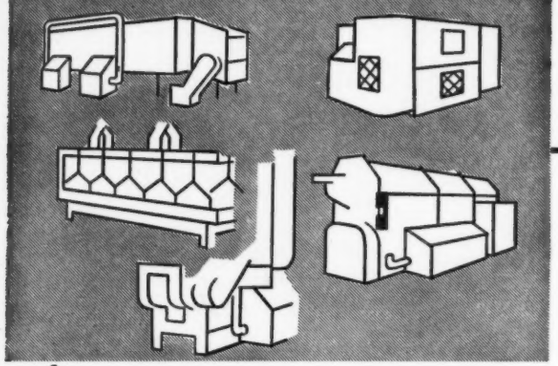
. . . for ALL metal-working needs!



Here are INDUSTRIAL'S five basic designs of metal cleaning and treating machines. This all-inclusive range includes the appropriate equipment to efficiently and economically perform every washing, cleaning, rinsing, slushing, dipping, Bonderizing and drying operation in the field—with the added benefits of exclusive INDUSTRIAL features.

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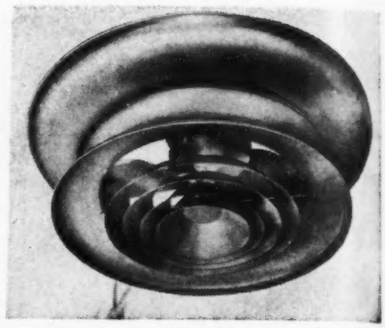
INDUSTRIAL WASHING MACHINE CORP.

Specialists in Cleaning Equipment Design and Manufacture

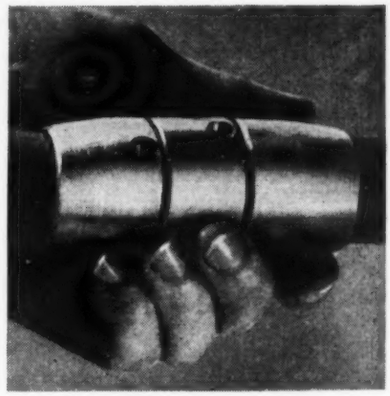
Dept. F-3 **New Brunswick, N. J.**



fan turns itself on. Speed of the fan may be varied by manual control. An 18-in. unit, manually operated, also is available. Wilster, Inc., 5700 Detroit Ave., Cleveland.

HOSE COUPLING

Designed for working pressures 1000 p.s.i. or more in firefighting, spraying, and similar equipment, hose coupling is made of all-bronze casting. The ½-in. coupling is 3¾ inches long, with over-all diameter of 1⅜ inches. The full diameter of the hose is maintained throughout the connection,

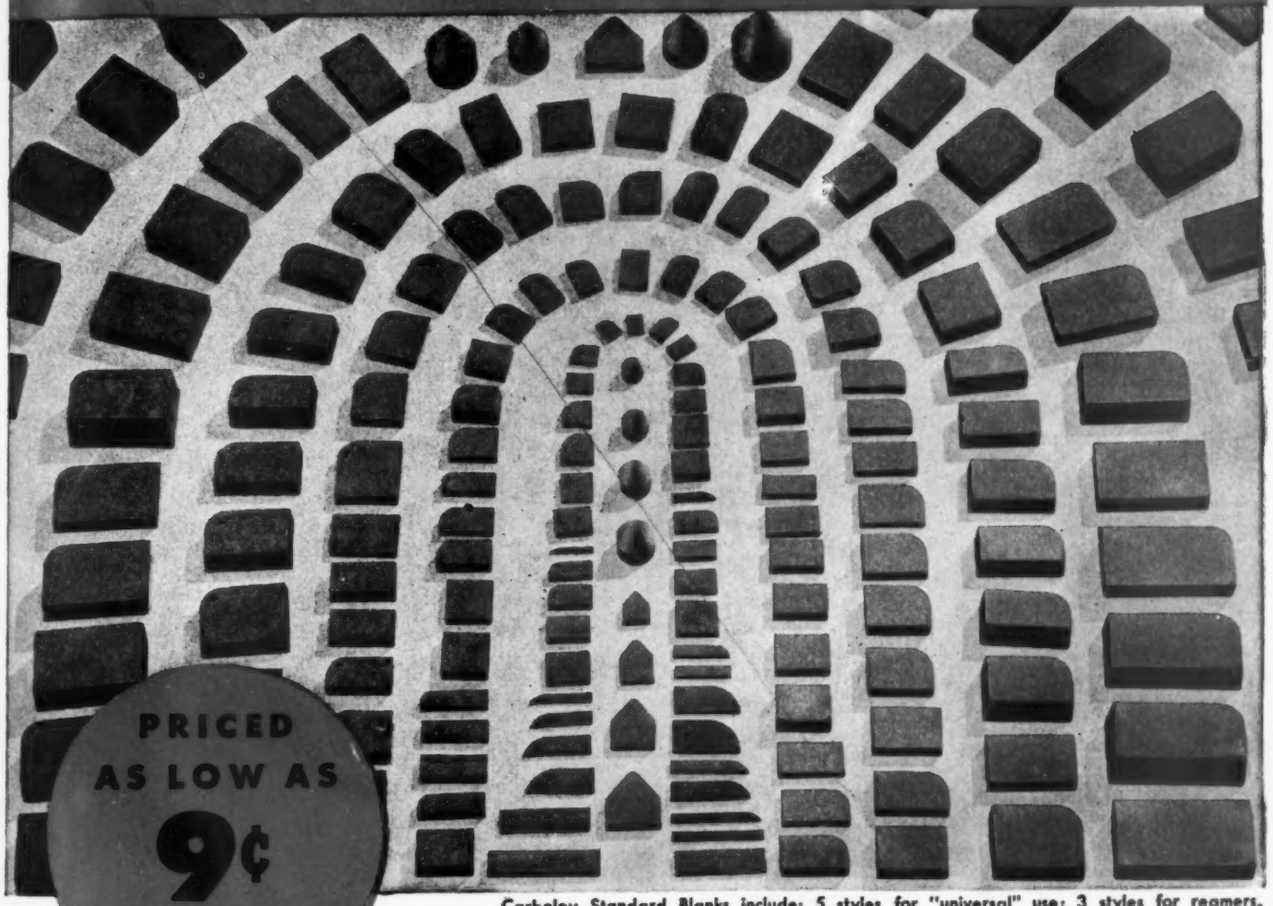


with no reduced flow or shrinkage of hose. Couplings are remountable so that broken hose can quickly be repaired in the field. Device holds hose stationary while tightening the internal expanders against inside shell wall, and a broaching allows a squared wrench to enter the coupling nut to tighten expander units. Available in ½-, ¾-, and 1¼-in. sizes. Bar-Way Mfg. Co., Stamford, Conn.

SOLENOID RELAY

Flexibility is featured in line of universal type solenoid relays. A simple shift of connections permits changing a set of normally open contacts to normally closed operation, or *vice versa*. Relays are available in 2-, 4-, 6-, and 8-pole construction. Contacts on 2- and 4-pole relays are universal, and the 6- and 8-pole relays have only four sets of universal contacts. The remaining contacts are of the conventional, normally open or normally closed type which cannot be changed in the field. Relays have a maximum current rating of 10 amperes, non-inductive, and can be obtained for operation on 25, 30, 40, 50, and 60 cycles, with voltages of from 6 to 600. The universal type is for switching circuits

For lowest cost—SPECIFY THESE "STANDARDS"



PRICED AS LOW AS **9¢** PER BLANK

Carboloy Standard Blanks include: 5 styles for "universal" use; 3 styles for reamers, scrapers (and centers)—in all the commonly used sizes and grades for machining all metals.

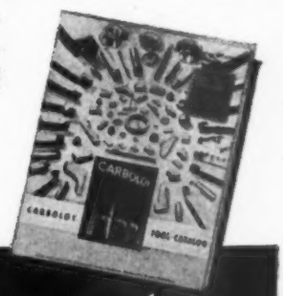
For 60-80% of all your carbide machining needs, you'll find Standard Carboloy Blanks tops in economy—flexibility—convenience. Here's why they rate so high in these important features—

1. ***Low Price:*** More than 50% of all general purpose Standard Carboloy Blanks range in price from 74 cents down to as little as 9 cents each!

2. ***"Universal" Application:*** Standard Blanks are designed for broad use throughout your range of machining requirements. With only a small, low-cost inventory in your crib, you're still prepared for quick tool-up on the average job.

3. ***Stocked for Prompt Delivery:*** Standard Blanks are stocked for quick delivery by Carboloy Company, and authorized distributors in 58 cities, coast to coast. Packaged in standard quantities, for your convenience.

Available in a wide range of sizes; in grades for cutting steel, cast-iron, non-ferrous metals and non-metallics. Write for FREE catalog GT-175R.



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THE BUFFALO WIRE CLOTH MAN

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. . . you can see from my silvery-white color. Just about every industry uses me . . . for strainers, filters, sieves, vibrator screens, dipping baskets, conveyor belts. Brother, I've got friends!

I'M ONE-THIRD COPPER
. . . and ⅔ nickel. That gives me "oomph" (strong, tough and hard, to you). I'm much stronger than common brasses and bronzes.

MAYBE YOU CAN'T RESIST ME
but I'M resistant. Rust? Poof . . . I'm immune to it. Corrosion? High temperatures? Kid's stuff! Abrasion? Stress? I wear like . . . . MONEL!

"Buffalo" Monel Wire Cloth is woven in a large range of meshes from very fine to coarse, in all standard weaves.

Buffalo WIRE WORKS CO., INC.
Manufacturer of All Kinds of Wire Cloth Since 1869
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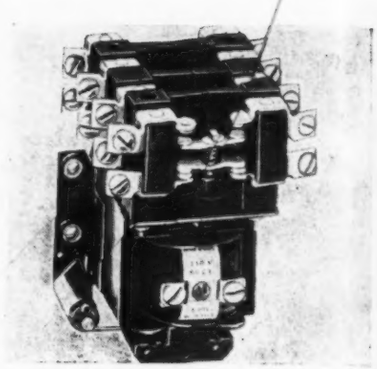
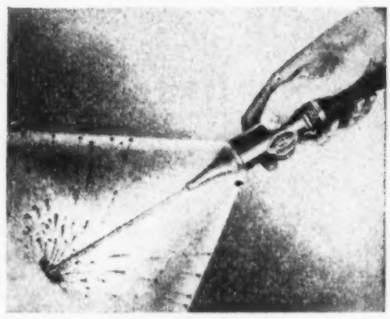


of like polarity, and cannot be used as reversing switches. Relays can be obtained either in the open style or mounted in an enclosure. Allen-Bradley Co., 1311 South First St., Milwaukee 4.

SAFETY AIR GUN

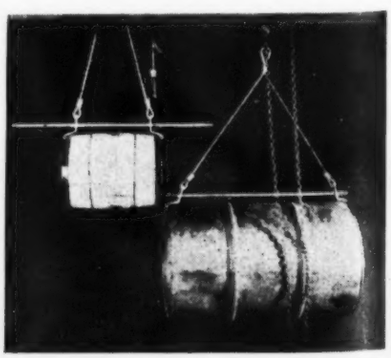
Airguard, located above the nozzle of air gun, called Guardair, provides a safety umbrella of air to protect user. Particles ejected by the nozzle are instantly removed from the work by a blast of air released

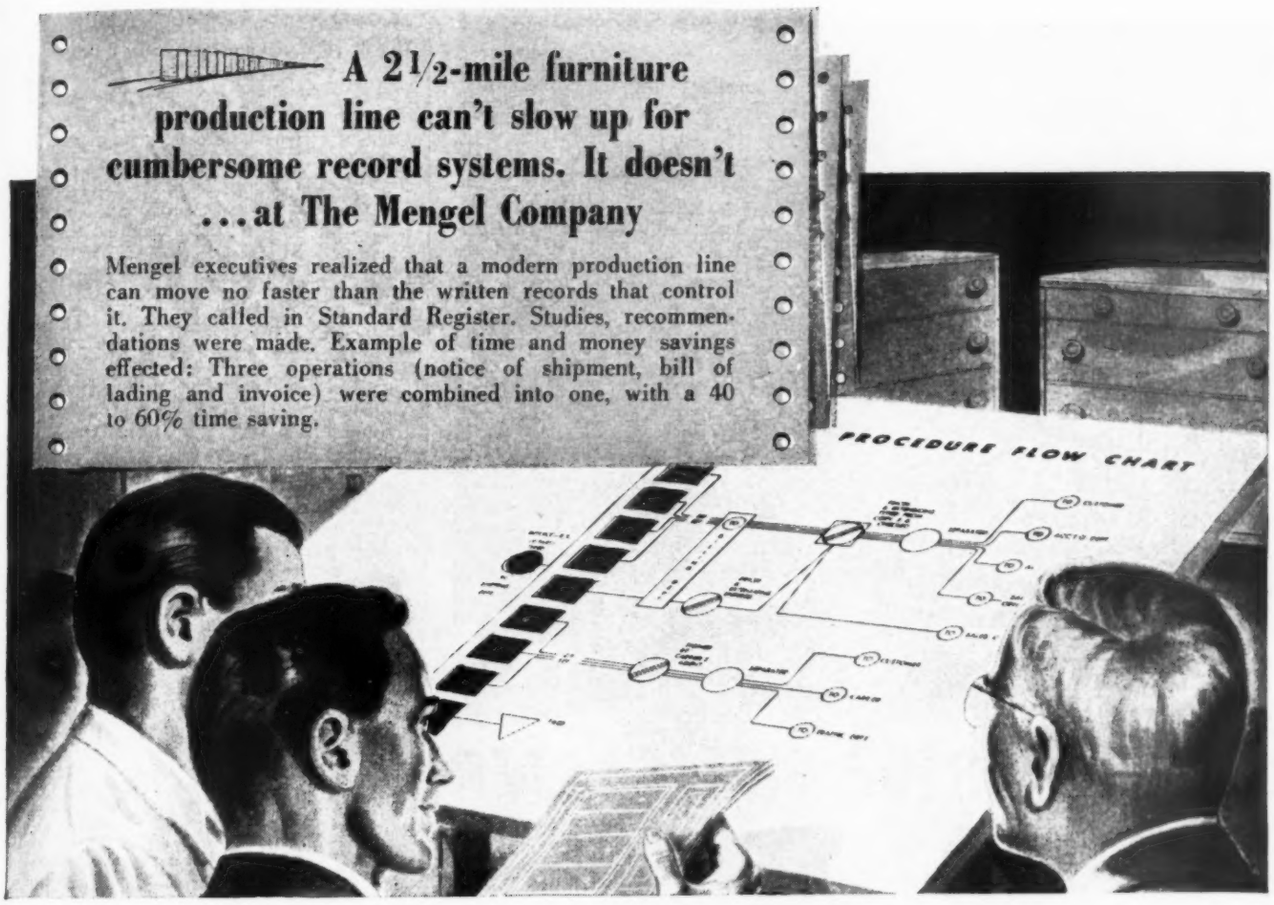


by a thumb button, preventing chips, metal powder, sawdust, oil, or similar materials from ricocheting into the operator's eyes. Air gun is available with standard nozzle and with extended tip for deep hole drilling operations, and in standard as well as special thread sizes to fit any hose coupling. Algonquin Parts, Inc., 5000 Connecticut Ave., South Norwalk, Conn.

SAFETY DRUM SLING

Designed for hoisting drum-type containers, the Trylon drum sling handles heavy drums, barrels, kegs, chemical and oil




A 2½-mile furniture production line can't slow up for cumbersome record systems. It doesn't ...at The Mengel Company
Mengel executives realized that a modern production line can move no faster than the written records that control it. They called in Standard Register. Studies, recommendations were made. Example of time and money savings effected: Three operations (notice of shipment, bill of lading and invoice) were combined into one, with a 40 to 60% time saving.
PROCEDURE FLOW CHART

Experience-proved: Standard Register's exclusive methods save most where record systems cost most

HOW CAN STANDARD REGISTER'S techniques uncover sources of savings that escape the usual office or systems study? The kind of savings that run into four, five, sometimes even six figures?

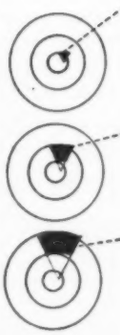
The answer is in Standard Register's entirely *different* approach and methods. Through a tested, step-by-step *procedure* (including analytical flow-charting of your present record system), Standard Register brings hidden waste into the open. Work making form design is discovered—corrected. So are time-wasting methods of writing and using forms.

Each of Standard Register's scientific, experience-proved steps plays its part in effecting savings where paperwork savings count most... in the cost of completed records and through better over-all management control.

★ ★ ★

Get additional facts about the Standard Register business systems (and the Formcraft-designed Kant-Slip forms which make them operate). Learn how they are effecting substantial savings for many a company like your own. Write. Ask a Standard representative to call. There is no obligation.

PROBLEM: FIND THE AREA WHERE SAVINGS COUNT MOST



Cost of printed forms: Savings as high as 10% in this area (because of difference in quality of paper, carbon, etc.) are relatively small. A few hundred dollars *at most.*

Cost of completed records: A 10% saving in the cost of writing, handling and using forms is 10 to 50 times greater, often runs into four figures.

Cost of the business operation, controlled by written systems: In this area, savings may multiply themselves into almost incalculable figures—through better management control.

THE STANDARD REGISTER COMPANY

Manufacturers of Record Systems of Control for Business and Industry

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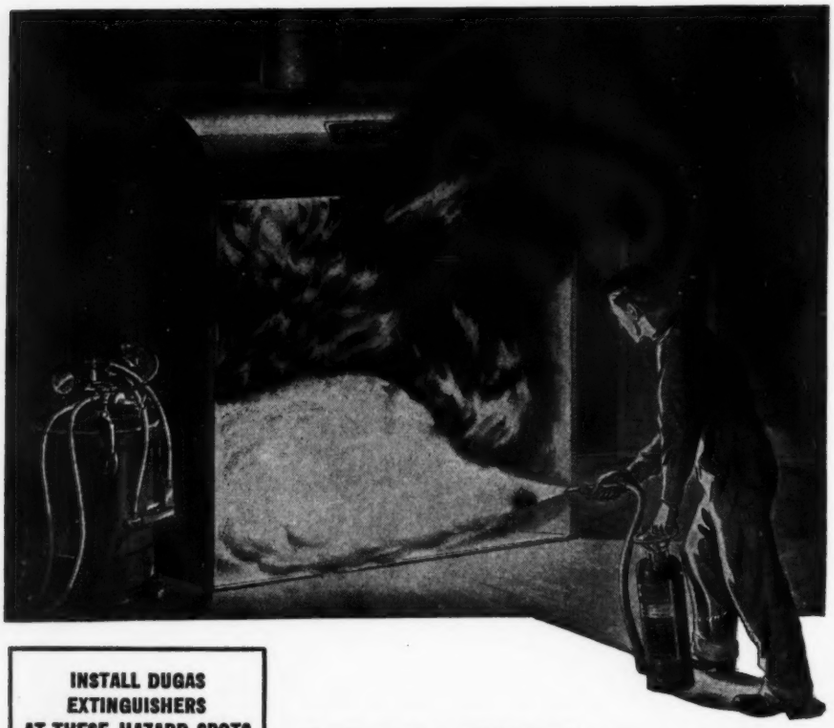
Pacific Coast: Sunset McKee-Standard Register Sales Co., Oakland 6, California. Canada: R. L. Crain Limited, Ottawa. London: W. H. Smith & Son, Ltd.



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● Upon striking fire, DUGAS Dry Chemical instantaneously releases 1,100 times its volume in flame-smothering gas that chokes off fire in seconds. The swift, fire-stopping power of DUGAS Dry Chemical is unaffected by wind or draft. It is undiluted by passage through the air. The gas is released only in the immediate flame area.

Dangerously close approach to flames is eliminated because the stream of dry chemical is expelled under high pressure, permitting safer and longer range fire extinguishing operation.

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DUGAS 15-T HAND EXTINGUISHER

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Write today for further information including authoritative, impartial data showing characteristics of all types of approved fire extinguishers. The Ansul technical staff of fire protection engineers is ready to serve you.

Listed and approved by Underwriters' Laboratories and Factory Mutual Laboratories.

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ANSUL CHEMICAL COMPANY
FIRE EXTINGUISHER DIVISION, MARINETTE, WISCONSIN

containers, large cans, and similar items. Heavy clips mounted on a rod with an adjustable pressure spring at each end grip the container until it is released by operator. Spacing of the clips can be altered to fit barrels, drums, or kegs of any size. The sling is equipped with 5/16-in. plow steel wire rope, and has a minimum breaking strength of 8000 pounds. The entire assembly is hot dip galvanized to prevent rust. Wire & Cable Div., Wind Turbine Co., West Chester, Pa.

BOX HANDLER

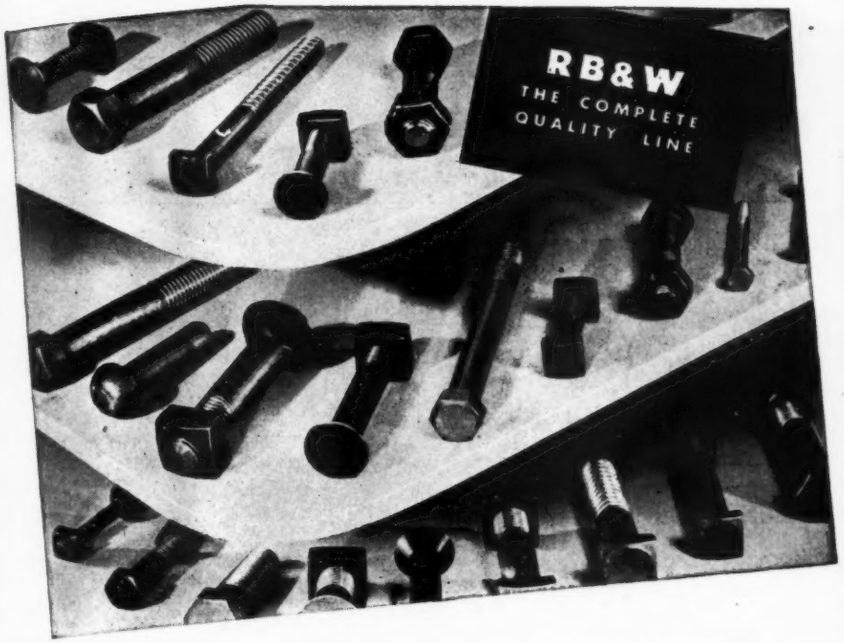
Quick and safe handling of long, narrow, wooden boxes is said to be provided by the No. 1472 Hay Box Grab. Operated from a single hoist hook, the gripper jaws

are pulled together, parallel to the load, by the plow-steel cable threaded around sheaves. Loads up to 1000 pounds are held, and boxes up to 20 feet long can be moved with the unit. The American Monorail Co., 13134 Athens Ave., Cleveland 7.

LIFT TRUCK UNLOADER

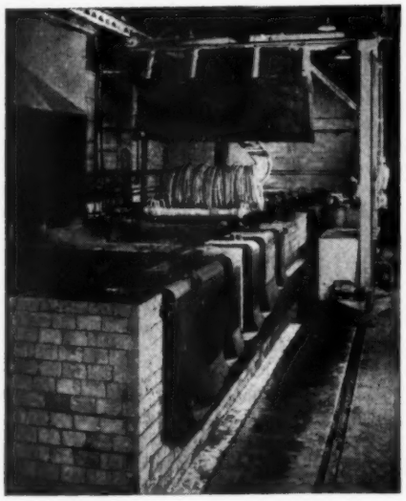
Designed for use with maker's lift trucks, unloader can be supplied for all sizes. The unit is hydraulically operated by the driver from his regular position in truck. Two double-acting hydraulic cylinders (one at

each side) move the vertical rack forward, pushing the load off the forks. Pulling power of unloader is equal to pushing power, and it may be used to pull dies from a die bed onto the forks, or from the die rack onto the forks, as well as for loading box cars. Towmotor Corp., 1226 East 152 St., Cleveland 10.



This photograph suggests the broad range of fasteners manufactured by RB&W. From stove bolts to Hi-Carbon Heat-Treated Cap Screws, the energies of development, manufacturing and quality-control departments are directed toward creating an *engineered* fastener — one that can be depended upon by the user for fast assembly, assured holding power, and appearance that will be a credit to the product on which it is used.

BOLTS BY BILLIONS — RB&W maintains stocks of raw material that are large enough to provide flexibility for a wide range of fastener production. This raw material is subject to careful analysis in RB&W's completely-equipped laboratory.



CLEANING AND COATING — RB&W draws its own wire to assure close tolerances vital to perfect cold-heading. Pickling — in this scientifically controlled cleaning department — leaves the wire free from mill scale, and provides opportunity to coat it properly for subsequent drawing and heading.

NUT FITTING AND PACKING — Fitting nut to bolt is a final inspection of the product, and provides protection for the threads during shipping and handling. From these automatic machines, assembled bolts and nuts are put into durable cartons and packages labeled for maximum visibility

FAST SERVICE — In RB&W's three plants (Port Chester, N. Y., Coraopolis, Pa., and Rock Falls, Ill.) immense stocks normally are carried in a broad variety of types, sizes and finishes. Modern handling equipment contributes to rapid shipment, full quantities, and accurate markings.

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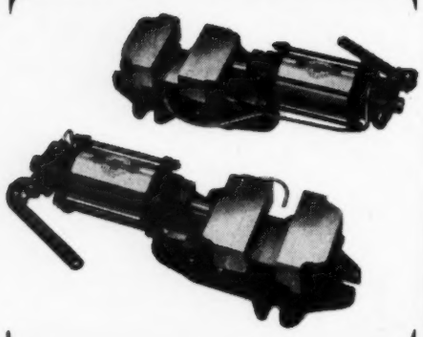
FOR FASTER *Assembly* OPERATIONS



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Users report . . . this fast, precision-built BELLOWS AIR VISE speeds up clamping operations 50% to 500%

The CV40B Air Vise develops clamping pressures from 0 to 500 lbs. or more, in an infinitely variable range. Exhaust air stream may be used to eject parts or to clean work area. May be hand or foot operated, or controlled by solenoid. Readily synchronized to other machine operations.

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Adjustable up to maximum of 2¼".

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Write for Bulletin CV40B-1

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861 East Tallmadge Ave. Akron, Ohio

SIGNIFICANT LABOR DEVELOPMENTS

BENJAMIN WERNE, Lecturer in Government Regulation, New York University, and a member of the New York Bar

Period Surveyed: June 1 to July 1

TREND INDICATORS

SUPERSENIORITY DENIED

With only one judge dissenting, the United States Supreme Court denied veterans any right to "superseniority." The case involved a welder-veteran, Abraham Fishgold, who maintained that the Selective Service and Training Act entitled him to one year's employment in his former job with Sullivan Drydock & Repair Corporation, irrespective of the seniority rights of any of the other employees in the plant. Fishgold had been reinstated in his old job after his honorable discharge from the service but within his first year on the job he was laid off when the work slackened, while other employees having greater seniority were retained. Fishgold brought the case to the district court which awarded him reinstatement rights and back pay for the nine days' period of the layoff. On the union's appeal to the appelate court on the ground that such a decision would conflict with collective bargaining agreements, the lower court's ruling was set aside on the ground that the collective bargaining agreement existing at the time between the company and the union justified the employer's selection of employees for layoff.

Mr. Justice Douglas, expressing the opinion of the majority of the court, pointed out that the law should be liberally interpreted for returning veterans who have spent time in their country's service, but "we would distort the language of these provisions if we read it as granting the veteran an increase in seniority over what he would have had if he had never entered the armed services."

He continued: "No step-up or gain in priority can be fairly implied. Congress protected the veteran against loss of ground or demotion on his return. The provisions for restoration without loss of seniority to his old position or a position of like seniority mean no more." (Fishgold v. Sullivan Drydock & Repair Corporation, U. S. Sup. Ct.)

WHAT IS "TEMPORARY" EMPLOYEE

A federal district court held that an employee-veteran held a permanent job at the time of his induction where he had been originally employed in a permanent position and was subsequently transferred to a temporary job, from which he was inducted. The veteran had been originally engaged in the employer's regular shop and was later transferred to the employer's gun shop in which the work was eliminated at the cessation of the war.

The court construed the term "position" in the Selective Service Act to mean "the employment and not the particular job the employee was performing." The court stated that if the employee had been employed for the gun shop at the outset and worked there, then he would have held a temporary position, but any employee who was employed in the regular shop and transferred for work in the gun shop continues to have a permanent position. The veteran was accordingly awarded reinstatement right with seniority to work on a machine in the regular shop similar to the machine at which he worked when he left the employment. (Morgan v. Wheland Company, USDC E. Tenn.)

A veteran does not have any claim to his former position if such position was only "temporary employment." Thus where a union shop contract called for completion of a 90-day probationary period for new employees, and the veteran involved had completed only 85 days of employment before his induction, a federal district court upheld the employer's action in rehiring the veteran as a new employee. The contract provided that, "New employees who are eligible to membership in the association shall within 90 days of their date of employment become members and remain members in good standing as a condition precedent to continued employment with the company." Prior to his induction, the veteran had never become a union member. The veteran contended that the period spent in the armed forces added to his 85 days entitled him to reinstatement under the Draft Law. But the court found that he was not so entitled since he had not established seniority prior to his induction. (Johnson v. Interstate Transit Lines, USDC Utah)

"CAUSE" FOR DISCHARGE

A reinstated veteran's refusal to join the union holding a closed-shop contract with his employer constitutes "cause" for the discharge of the veteran within his first year after reinstatement. In the particular case, a closed-shop contract had been executed shortly before the employee left the company to enter the armed services.

Before his induction, he did not officially join the union, and upon his return he refused to join. To the union's request that the veteran be discharged the company refused on the ground that no "cause"

The Finnell Hot-Wax Process
REDUCES THE FREQUENCY OF WAXING

Here is a type of floor wax and a method of applying it which combine to produce a finish unique in wearing qualities. The wax is *Finnell-Kote*, a solid wax containing genuine Carnauba. The method of application is mechanical.

***Finnell-Kote*, which is so solid it must be melted before it can be applied, is heated in a *Finnell-Kote Dispenser* attached to a *Finnell* machine. The melted wax is fed to the floor through the center of the brush ring and is rapidly spread by the revolving brushes. In this process, the higher wax content of *Finnell-Kote* (three to four times greater than average wax) is thoroughly utilized. The result is an enduring, highly protective finish that actually *seals* out dirt and grime. Hot waxing with *Finnell-Kote* is *waxing at its best!* More economical, too, on a year-to-year cost basis, since fewer applications are required. *Finnell-Kote* sets in less than ten seconds! Polishes to a beautiful, non-skid finish. Can be used on all types of flooring.**

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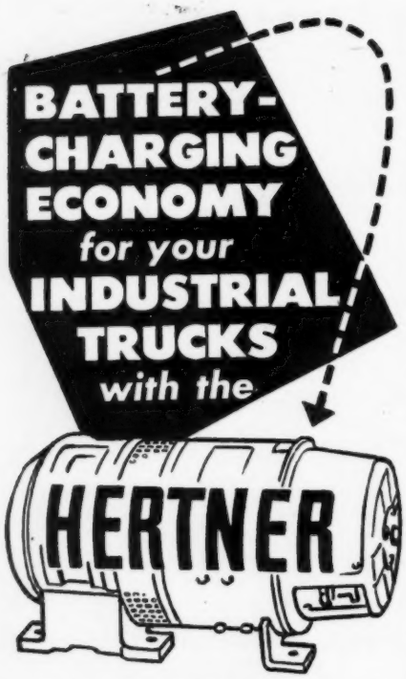
BRANCHES IN ALL PRINCIPAL CITIES



Motor-Generator

Model "K-1" Charging Unit

With the Hertner Type "K-1" Motor-Generator Single Circuit Charging Unit for electric industrial truck batteries no current is wasted during the charging period since charging resistors are not used when charging.

Each Hertner K-1 Unit is specially designed for the particular battery to be charged. For lead-acid battery charging (in 8 hours), the generators are of the drooping volt-ampere type which automatically tapers the charging current as the charge progresses; for nickel-alkaline battery charging in 7 hours, the generator is of the constant-current type.

Fully Automatic

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4. Automatic protection against reversal of current.
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Write for Bulletin 104 describing Hertner Model "K-1" Single-Battery Charger. Multiple chargers for all types of batteries are also available. For details, send us your requirements.

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existed under the Selective Service and Training Act for his dismissal. The arbitrator, while conceding that the employer acted in good faith in the matter, reasoned that the Draft Law should be interpreted in view of the "accepted industrial practice and standards" and the particular facts in each case. The fact that the employee himself did not enter into the contract was deemed immaterial, since the terms and conditions of a collective bargaining agreement executed between an employer and a union, the latter being duly recognized as the exclusive bargaining agent for all the employees in the unit, are binding upon all employees covered by the agreement. Considering, as the Act specifically provides, the veteran as having been on furlough or leave of absence during his period of service, the renewal agreements executed by the union, the exclusive bargaining representative, are likewise binding and effective upon the employee upon his return to the job. The conditions of employment in effect before the employee was inducted are no less binding when he returns to work. (In re arbitration between Abe Cohen's Exchange, Inc., and Retail & Wholesale Employees' Union, Local 830)

DISLOYALTY GROUND FOR DENYING REINSTATEMENT

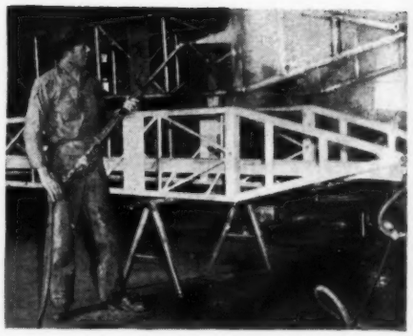
Reinstatement rights were denied a Naval officer who held the position of first vice-president of a corporation at the time he was inducted and who continued to hold such office for several months after entering the Navy, on the ground that he committed disloyal acts against the company while he was in service.

While still the company's vice-president the veteran sent letters to the employees and customers of the company enticing them to a competing company, causing the company annoyance, trouble, and embarrassment, although little if any actual monetary loss. Because of such disloyal conduct, the company removed the veteran as an officer of the corporation before his discharge from service.

The court concluded that the veteran when he applied for reinstatement was not "still qualified" to perform the duties, and, because of his antagonistic activities, he was not temperamentally qualified to continue as an active manager of the corporation. Such inharmonious relationships with associates would naturally result in a personal lack of cooperation, with attendant losses to the business.

Similarly, the court concluded that the circumstances affecting the business of the corporation were so changed that it would be unreasonable for it to reemploy him. The change in the circumstances was effected by the veteran's own voluntary activities.

The court further pointed out that the veteran did not leave his position to perform Naval services when, as a matter of fact, he held the position for 7 months after his entry into Naval service. He lost the position not because his Naval duties rendered him unable to perform or retain it, but because in the perform-



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This heavy-duty alkaline dirt-chaser detaches muck, mineral greases, heavy soil deposits with incredible speed. It prevents clogging of steam-generating equipment. It rinses freely, leaving no films on surfaces. It is extremely efficient in hard water areas. And only ⅛ to 2 oz. per gallon of water are required for effective action!

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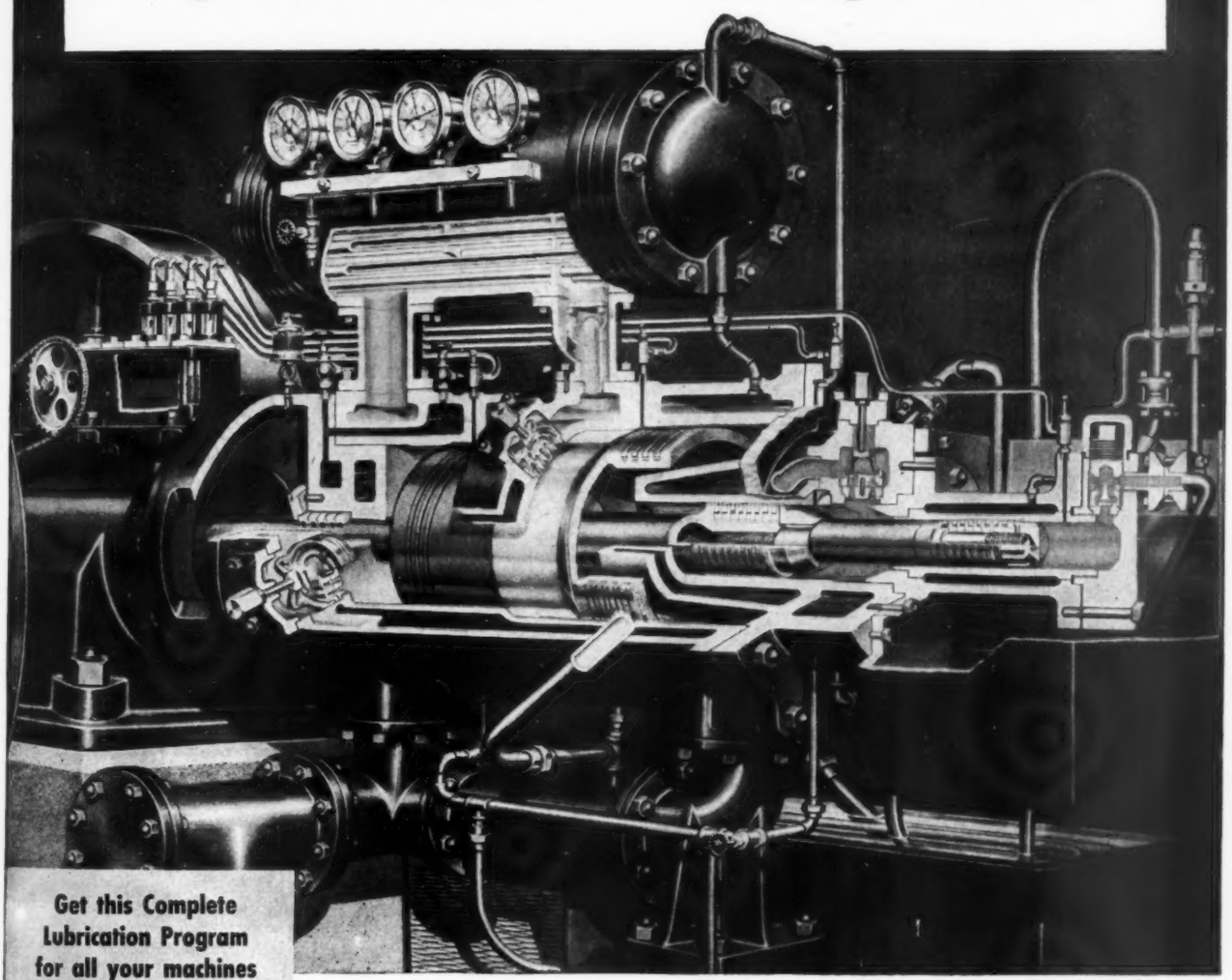

This drawing prepared with cooperation of Norwalk Co., Inc.

THIS complex machine is a multi-stage air-compressor. It sucks in air . . . or gas . . . at low pressures and in four successive steps, squeezes it to pressures of 3,000 pounds per square inch.

The part that is played by oil in lubricating the many moving parts, is shown by the red films.

Because of the terrific pressures and heat developed, correct lubrication is a difficult problem. But it's a problem already solved — like so many others throughout industry — by a new Socony-Vacuum oil. This oil protects against wear under the mounting pressures, resists the formation of carbon deposits and stays on vital parts despite the washing action of condensing moisture.

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(6) Maximum strength of screw itself assured by *"pressur-forming"* of special-analysis ALLENOY steel. Threaded to a high Class 3 fit.

(7) Speed in assembly provided for by use of Allen hand drivers and key blades for power drivers.

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ance of his office he was guilty of acts of misconduct whose normal consequence, in any properly governed corporation, is removal from office. (McClayton v. Cassell Company, USDC Md.)

REDUCTION OF VETERANS' SALARIES DISALLOWED

A regional wage stabilization award recently ruled that employers may not reduce the salaries of veteran-employees on the ground that they are receiving subsistence allowances from the federal government under the veteran training program. The employer in question, a publisher, sought to reduce the salaries of two employees from $200 to $175 a month and from $150 to $110 a month, and of two other employees from $151.67 to $90 a month and from $151.67 to $140 a month. The employer hired the employees at present rates while awaiting agreement on a training program from the Veterans Administration. The regional board denied the company's request for the salary decreases. (New Tribune Company, RWSB—VII)

DOWNGRADING EMPLOYEES TO FAVOR VETERANS

An employer's contractual and statutory duty to reemploy returning veterans is justifiable ground for effecting the downgrading of other junior employees to make room for the veterans. Such was an arbitrator's decision in a recent case in which the employer was upheld in his action when he downgraded two employees to jobs two grades below one formerly held so that two returning veterans might be reinstated in their former positions or equivalent ones. The arbitrator explains that the employer has the right to take such action on the basis of contractual clauses providing that veterans be reemployed in their old or equivalent jobs, and that the employer may transfer workers from one job to another. The transfer, effected after discussion with the union, was deemed non-discriminatory and not violative of the contract, since it did not violate the seniority rights of anyone, the contract did not specify job sequence in case of downgrading, and no jobs were available at the next lower classification.

In upholding the transfer, the arbitrator pointed out that to prohibit the employer from demoting employees to enable the placing of the veterans would be to compel the employer to continue the employment of more employees than are required. To impose such a burden would be unwarranted unless the contract had expressly provided for such practice. (In re arbitration between Lapham-Hickey Company and United Steelworkers of America, Local 3020)

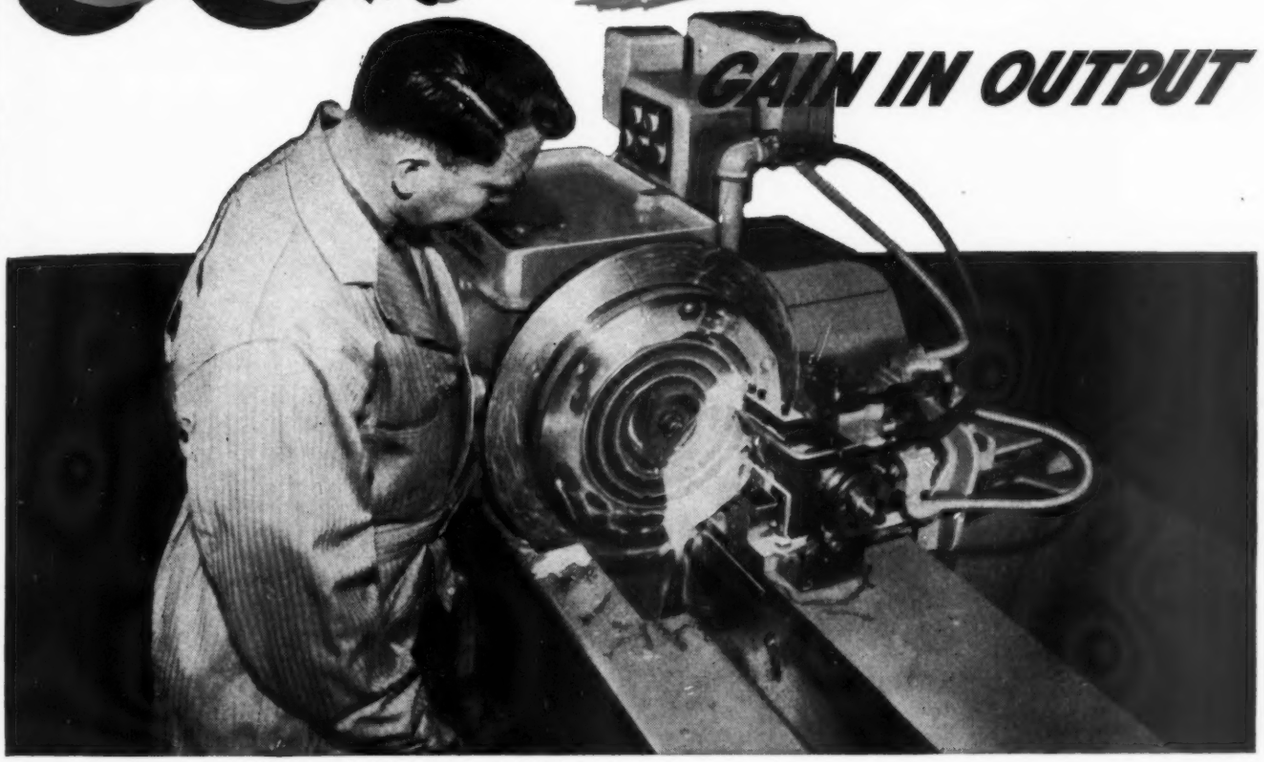
HELD TIME WORKED

Time spent in walking to work on the employer's premises after punching in on the time clock.

Time spent after arriving at the place of work in certain preliminary activities, such as putting on work clothes, and preparing

66% Extra

GAIN IN OUTPUT



. . . when this automatic lathe was THY-MO-TROL equipped

Here's another striking example of the production gains that can result from the partnership of a modern automatic tool and G-E Thy-mo-trol drive.

To speed the cutting of a groove (0.065 in. wide, 0.070 in. deep) on a cartridge reel, a metal-working plant first shifted the work from an older type machine to a modern Sundstrand automatic lathe with special tooling. As then equipped with a two-speed, 2-to-1 ratio motor drive, the output rate of the new lathe was three per hour.

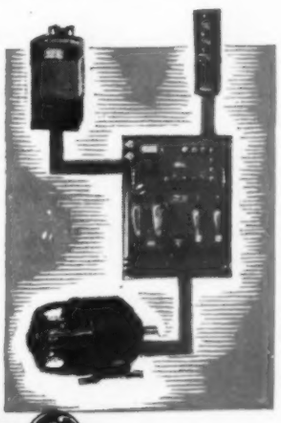
Later, with a change to electronic, stepless speed control of the lathe instead of the two-speed drive, an increase to five pieces per hour was obtained—a 66 per cent *extra* gain, thanks entirely to Thy-mo-trol.

Develops Full Potential of Good Tools

On new machines which are the pride of leading machine-tool designers, G-E Thy-mo-trol drive gives the precision control of speed and torque that's needed to get the most out of all the other advanced features. It provides rapid, controlled-current acceleration and dynamic braking. Speeds can be preset on a small dial that's part of the push-button station. Yet the drive operates from an ordinary a-c power source.

A Complete Drive

Standard Thy-mo-trol drives are available from ⅛ to 25 horsepower. And larger sizes can be furnished. Four compact units—d-c motor, electronic panel, power transformer, and control station—make up the complete drive. For full information, call your local G-E representative. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*



GENERAL ELECTRIC

Willson Makes NEWS In PLASTIC EYE PROTECTION

For Light Grinding, Wood Working, Spot Welding and Similar Jobs

Here's the solution to the problem of keeping safety spectacles on workers in semi-hazardous jobs—the new Willson FeatherSpec. So light in weight (less than an ounce) it can be worn all day long with complete comfort—even over regular glasses.

FeatherSpec furnishes 2-way eye safety—from impact hazards and from glare. The large one-piece lens provides wide angle vision as well as high frontal impact strength. The special "suspension-lock" frame holds the lens firmly in position, yet permits replacement in ten seconds!

Give your workers the benefit of FeatherSpec's new comfort and extra protective features. Available in two lens shades—clear or the new Willson Tru-Hue green, which keeps out glare without color distortion.

MORE PROTECTION WITH PLASTICS

WILLSON MONO-GOGGLE—Made of shatterproof plastic for over-all eye and nose safety. MonoGoggle wearers get extra comfort because of light weight, rolled contact edges, adjustable headband. Clear or Willson Tru-Hue green lens. May be worn over glasses.

For help with your eye protection problems, consult your Willson distributor or write to Willson Products, Inc., 219 Washington St., Reading, Pa.

*T. M. Reg. U. S. Pat. Off.

WILLSON PROTECTO-SHIELD*—Furnishes full-time safety for both front and sides of face. Lightweight, snug-fitting, comfortable. Tilted visor available in three lengths. Clear or Tru-Hue green plastic.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON PRODUCTS INCORPORATED

READING, PA., U. S. A. Established 1870

equipment. (Anderson v. Mt. Clemens Pastry Company, U. S. Sup. Ct.)

Lunch periods for guards employed aboard vessels which are being repaired, inasmuch as they were not free to leave their posts and were not temporarily relieved from their duties. (Donza v. Mercantile Ship Repair Company, City Court, N. Y.)

OVERTIME PLAN INVALID

A contract, which fixed a uniform weekly wage to cover both straight time and overtime hours in excess of 40 a week, was held invalid under the Fair Labor Standards Act. The contract provided for a weekly wage and overtime by dividing the weekly wage by the number of hours employed, plus one-half of the hours employed, plus one-half of the hours actually employed over 40. The Court held that the contract was designed to circumvent the overtime requirements of the Act, and therefore was invalid. (Asselta v. 149 Madison Avenue Corporation, CCA-2)

HELD UNDER THE ACT

Warehouses in which merchandise is stored for delivery either to the retail stores for sale to customers *or* to the customers directly from the warehouse. The Wage-Hour Division announced that it would not enforce this new policy until July 1, so as to give employers affected time to change their operating method to comply with the order.

Employees who install service and repair burglar alarm systems for local customers, 7.5 percent of whom are engaged in the production of goods for interstate commerce. The court based its decision on the theory that a burglar alarm system is a substitute for a watchman, and since the latter is covered by the Act so should the former as "necessary to the production of goods for commerce." (Walling v. Thompson, USDC S. Cal.)

Motor carrier employees who devoted the greater part of their work week on non-exempt activities, some of which are already covered by the Act. (Walling v. Morris, CCA 6)

HELD NOT EXEMPT

A circuit court of appeals recently ruled that licensed operating engineers in charge of dangerous and complicated machinery in a power plant when no one else was present are not exempt from the Wage-Hour Law as "executives." As stated by the court, the Wage-Hour Administrator has the power to set regulations governing the coverage of the Act and not the courts. (Walling v. General Industries Company, CCA 6)

HELD NOT UNDER THE ACT

Building service employees, servicing a building in which less than 20 percent of the rentable area was tenanted by firms engaged in the production of goods for commerce. (11 Park Place Corporation, USDC S. New York)

Apprentices learning the railroad busi-

NO.5 THE PUZZLE OF THE VANISHING DOLLAR?

Get this! Three gents put up at a hotel, paying $30 rent in advance. Shortly afterward the clerk discovers that he has overcharged them $5, so he sends that amount back by the bellhop. But the bellhop, a weak character, returns only $3. Now the men have paid $27 and the bellhop has $2 — making a total of $29. *What became of the extra dollar?*

And a very appropriate little problem, too. For many's the dollar that's vanishing, these days, in seemingly simple operations.

Metal tur[illegible]ts are a problem. The chances are that turnin[illegible]25 per cent or more of all machining time [illegible]

There are cases in our files of savings of hundreds of dollars a month in the manufacture of a single part by the use of Jones & Lamson machines. Our machines are designed specifically for the most efficient use of carbide tools which can remove metal 200 to 500 per cent faster. We have solved many tough cost problems. Solving them is our business.

Be skeptical of the production efficiency of all metal turning equipment in your plant.

Telephone or write for a Jones & Lamson engineer who will be glad to consult with you on all phases of your metal turning problems.

[illegible]NES & LAMSON

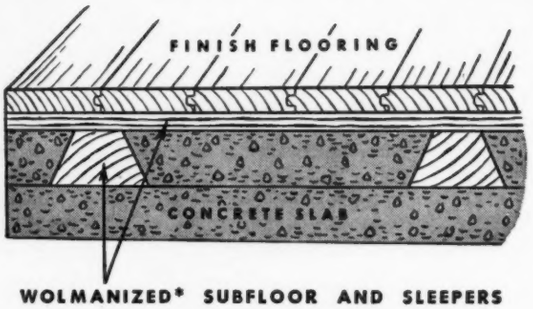
MACHINE COMPANY

Springfield, Vermont, U.S.A.

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies.

Speaking of floors

WE LIKE TO BE IN THE MIDDLE



WOLMANIZED* SUBFLOOR AND SLEEPERS

Here's the spot—in the middle—where Wolmanized Lumber belongs. You don't want your floors to loosen, decay and crumble. Untreated lumber is food for fungus — moisture makes it grow. On Wolmanized Lumber decay fungus cannot grow—the Wolman Salts* preservative is fatal to it. Use Wolmanized Lumber generously on all subfloor construction . . . and you'll add years to the service life of your buildings.

PRESSURE TREATMENT...

DRIVES PROTECTION DEEP

You can't just brush it on, you can't dunk it on . . . you've got to drive it into the fibers of the wood to get real protection. Here at American Lumber & Treating Company, we do it under great pressure in steel retorts. The protection is there for keeps.

*Registered trademarks

1676 McCORMICK BUILDING, CHICAGO 4, ILLINOIS

ness, referred to as "cubs" or "posters" in the trade, because (1) the company exercised no control over them during the learner period; (2) the apprentices came to the company of their own free will and were not obligated to become regular employees; and (3) they did not perform work which benefitted the company. (Walling v. Nashville, Chattanooga & St. Louis Railway, CCA 6)

HELD UNDER THE WALSH-HEALEY ACT

Company supplying the labor and the metal eyelets necessary to assemble and complete tents, under a government contract. This work is not regarded as "personal services" exempt from the Act. (Old Dominion Manufacturing Company, Inc., Public Contracts Administrator)

RECONVERSION CONTROLS

*RATES FOR NEW JOBS

Revising General Order No. 6 of the former National War Labor Board, the Wage Stabilization Board issues new rules for the setting of wage or salary rates for new jobs. No approval is necessary for the hiring of an individual at a rate in excess of the properly established rate in the plant. However, this excess rate may not be used as a basis for price relief or for increasing the cost of goods or services for the government unless the excess rate has been approved by the Wage Stabilization Board. On the other hand, board approval is necessary for the hiring of an individual at a rate lower than the rate properly established in the plant, since such lower rate constitutes a decrease and is subject, under the regulations, to board action.

In the case of setting rates for new jobs or new plants, no approval need be obtained from the board where:

1. The rate is to be set in an established plant for new job classifications, or for existing job classifications in which there has been a significant change in job content, *if* the new rates are set on the basis of previously existing rate-setting practices, so that equivalent rates are paid for jobs of equivalent job content, and proper rate relationships are maintained between related job classifications.

2. A new plant is being established and there are no more than eight employees, if, when the plant does employ more than eight workers, all rates, including those already established, are submitted to the board within 30 days from the date that more than eight are in the plant's employ.

Rates requiring approval because they constitute decreases or are to be used for price relief or increased costs to the government will be approved by the board if:

1. They are based upon rates paid for

* In this and the following classification items marked with an asterisk also are considered to be trend indicators.

Means a Lot of Different Things to a Lot of Different Designers

Some designers choose felt for its resiliency; others for firmness. Some see it as the perfect wicking material; others as the best lubrication seal.

Felt is funny that way. It can be processed to almost any consistency from the softness of a puppy's ear to the hardness of a seasoned maple board.

It won't ravel, shred or fray — can be die-cut, punched, skived, chiseled, turned, scarfed, ground or otherwise processed by simple and common methods.

It is unaffected by normal atmospheric conditions — moisture, sun, heat, cold: won't deteriorate with age or use; doesn't suffer from exposure to oil or gasoline.

The Felters Company designs felts of quality, weight and thickness to fit *any* design requirements — cuts them to the exact shape and size needed.

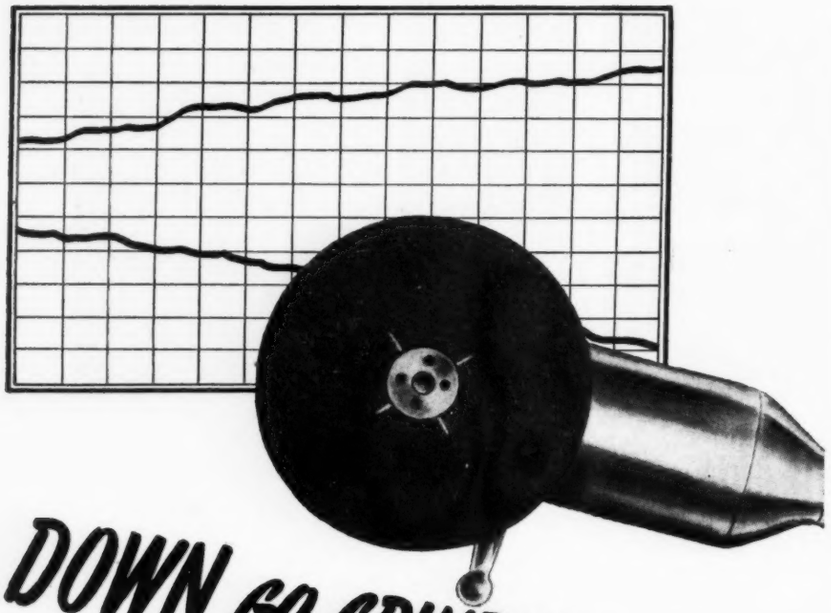
The Felters Company, 210-A South Street, Boston 11, Mass. *Offices:* New York, Philadelphia, Chicago, Detroit. *Sales Representatives:* San Francisco, St. Louis. *Mills:* Johnson City, New York; Millbury, Mass.; Jackson, Mich.

THE
FELTERS
COMPANY

Makes the Felt for the Parts it Cuts

WELDISK

UP GO GRINDING SPEEDS



DOWN GO GRINDING COSTS

Prove it to yourself with FREE SAMPLES

If the test of the pudding is in the eating, the test of an abrasive is in the grinding. It will pay you to test WELDISKS yourself – to prove to your own satisfaction that WELDISKS are superior abrasives for use on high-speed pneumatic grinders as well as on any portable electric grinder. You will be amazed to find that WELDISKS outlast ordinary disks by as much as 2-to-1 . . . partly because of their cold-setting cement (a scientific formula – not glue or resin) that actually improves with age, and partly because of their laminated backing of fibre for stiffness plus cloth for strength. A test of WELDISKS will convince you of their superiority. Write for free samples. State size of disk, grade of grit, and brief description of work to be done. WELDISKS will be sent promptly without obligation to you.

Abrasive Products, Inc.

SOUTH BRAINTREE 85, MASSACHUSETTS

JEWELOX • JEWEL EMERY • JEWEL GARNET • JEWELITE • JEWEL FLINT • NEW PROCESS

comparable occupations in the local-labor-market area involved.

2. They are based on wage rate practices previously established in other plants operated by the employer.

3. They are based upon rates paid for comparable occupations in other plants in the industry involved. This last criterion is to be applied only where (1) and (2) are not applicable.

WAGE REDUCTION ILLEGAL

A reduction of the wage rates paid union officials was held by the board to be an illegal wage decrease, even though the contract which provided for the higher rates was canceled. Under the contract provisions, certain union officials were paid the highest existing rate in the plant for hours worked, but upon termination of the contract, the company reduced them to their lower, regular job rates. Although the higher payments were no longer required under contract provisions, they were required under wage stabilization rules which forbid wage reductions without approval. (Kelsey-Hayes Wheel Corporation v. United Automobile Workers, WSB)

*DECREASE DISALLOWED

Without issuing an explanatory statement, the WSB refused a company-employee request to decrease salesmen's commissions. The employer explained that should the request for decrease be refused, the employees would have to be laid off, since he would be financially unable to pay the regular commissions. The salesmen involved joined in with the company in its request. The Wage Stabilization Division pointed out that a wage increase was involved which was not justified as necessary in order to correct "gross inequities" within the meaning of wage stabilization regulations. (Audubon Distributing Co., WSB)

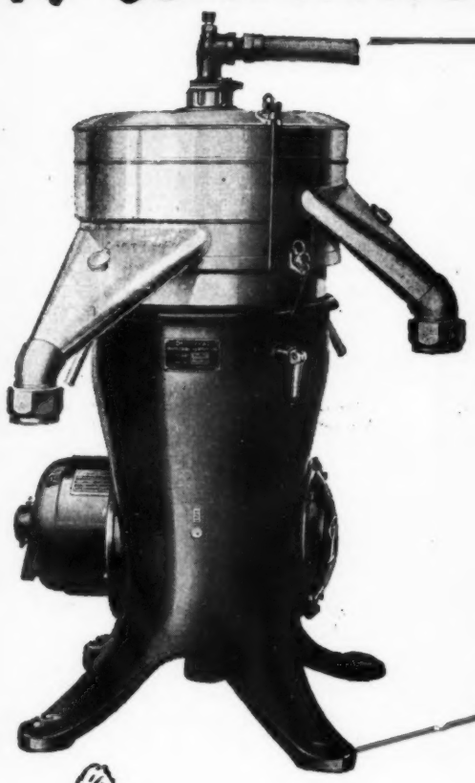
Upon changing over from a two-shift to three-shift operation, a company requested approval for a decrease in the previous premium of 10 percent paid to second shift workers. The change in shifts brought a reduction in hours from 11½ on the former second shift to 8 hours each on the new second and third shifts. The company intended to pay a 5-cent hourly premium for the second shift and a 7-cent hourly premium for the third shift in keeping with industry-area practice. Upon finding that employees would earn 3.8 cents less under the new wage system, the board disapproved the change as an unlawful wage decrease. (General Manufacturing Company, WSB)

*LIMITED PRICE RELIEF GRANTED

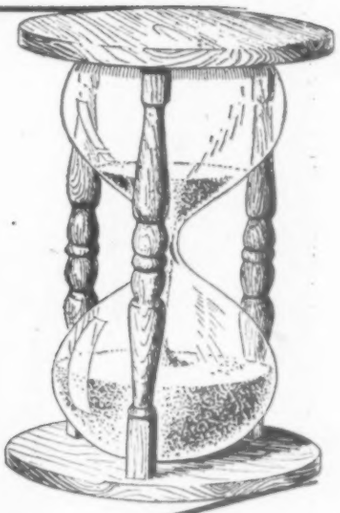
The government's wage-price policy permitting the approval for pricing purposes of wage increases which would correct gross inequities between related plants in the same industry or area, does not allow a partially approved increase put into effect to become a standard by which the full raise may be approved for pricing purposes.

The Detroit regional stabilization board had approved an 18-cent increase for milk

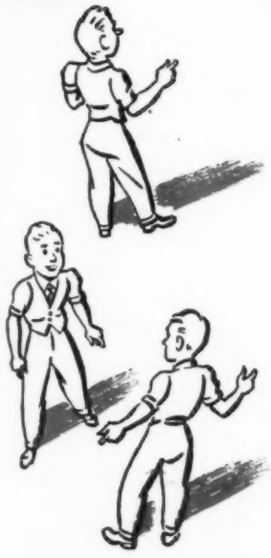
A Continuous Separator



DOES MORE THAN SAVE



Time!



TRUE, De Laval Industrial Separators and Purifiers save production time by making many processes continuous. For instance, factory oils of all kinds—lubricating oil, cutting oil, grinding coolant, hydraulic oils and many others may be continuously purified and returned to service. Removal of dirt, metallic particles and water from these factory oils restores them to full efficiency ***quickly***.

But speeding up production is only ***one*** phase of the work of De Laval centrifugals. Almost invariably it delivers a ***better product***. Centrifugal force effects such ***complete*** separation, or such complete purification, that a definite product improvement can often be noted.

In addition, De Laval Separators and Purifiers frequently make possible important savings in the liquids being processed for there is no waste when centrifugal force is the agent.

Write for additional details—mention what liquids you wish to separate or clarify.

DE LAVAL

THE DE LAVAL SEPARATOR COMPANY
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PURIFIERS AND CLARIFIERS FOR FACTORY OILS

In Clover
...with BRASS BOLTS

This is a "Milk Factory" . . . producing milk for butter, cheese and other products of the great Food Processing Industry.

No brass bolts in a cow? Of course not, but her health and the quality of her products are constantly guarded by non-rusting, non-corroding alloys.

Harper maintains a stock of more than 4850 different types of bolts, nuts, screws, washers, etc., made from Brass, Bronze, Monel Metal and Stainless Steel. Special engineering service is constantly available.

Wherever there is danger of rust or corrosion from moisture, acid or alkali consult your nearest factory branch or distributor.

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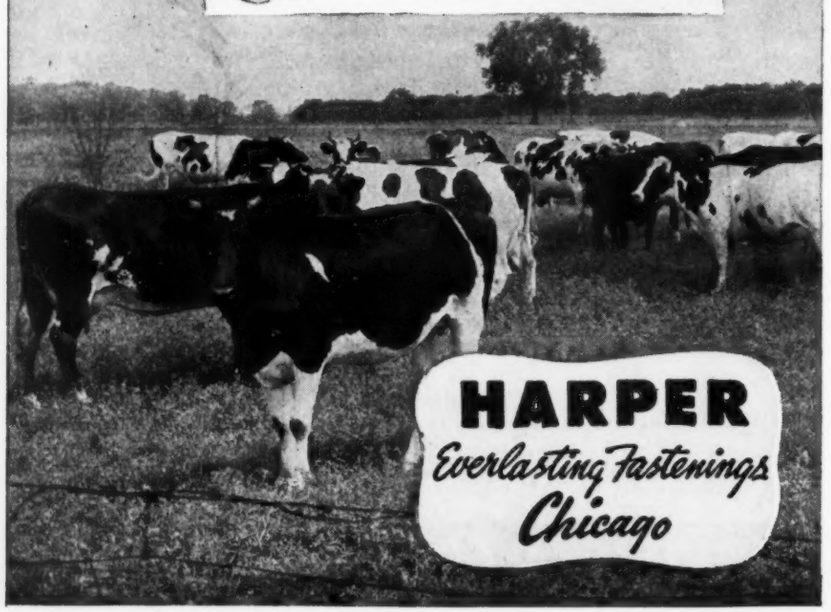
Cast Aluminum and Brass drinking bowl by the H. E. Bremer Manufacturing Co. of Milwaukee, using Harper Brass pins, bolts, nuts and screws, reduces bacterial breeding pockets to a minimum.



HARPER
Everlasting Fastenings
Chicago

creameries to correct a gross inequity resulting from an 18-cent raise granted to the milk dealers in the same area. The National Board approved 10 percent of the raise to the creameries for pricing purposes, thus forcing the creameries to absorb the balance of the raise as did the milk dealers. The dissenting members of the board contended that the majority decision was not understandable, inasmuch as it was the 18 cents established by the milk dealers as the increase (an increase which was the standard for 75 percent of the industry) which was the inequity to be corrected. The majority, however, pointed out that since the creameries and milk dealers were in parallel situations in that they had like types of operation, area of competition, and relationships to other industries in the area, the treatment accorded one should be accorded the other. Thus, since the milk dealers absorbed the increased labor cost above the approved 10 cents an hour so should the creameries.

NATIONAL LABOR RELATIONS BOARD

*MANAGEMENT'S RIGHT TO FREE SPEECH

The guarantee of free speech under the Constitution extends to "mere talk and argument" by an employer against a union, and therefore cannot be limited by the National Labor Relations Act. However, when such anti-union talk on the part of an employer is made against a background of long-time antagonism to unions, a circuit court has held that this Constitutional guarantee may not be used to protect such employer from a finding of interference. (R. R. Donnelley & Sons Company, NLRB)

*MANAGEMENT'S RIGHT TO TALK BEFORE ELECTION

Heretofore, announcement by the employer before an election that he would never recognize a closed shop or compulsory check-off was ruled by the board to be a violation of the Wagner Act, in that it discouraged employee's untrammeled right to organization. The latest word on the subject brings a reversal in board policy. In a recent case, it declared permissible an employer's announcement made three days before an election that:

"If and when an election is held, the company's policy will be as follows:

"That at no time will the company compel an employee to become a member of any particular union as a condition of employment.

"That under no condition will the company agree to deductions in wages against any employee's wishes to cover dues or assessments."

The board pointed out that while the employer declared his policy, such policy may, and often does, yield at the bargaining table. Thus, in announcing such a policy, the employer could not be regarded as having foreclosed the possibility of future bargaining with reference to these two matters. In addition, the board points out that the

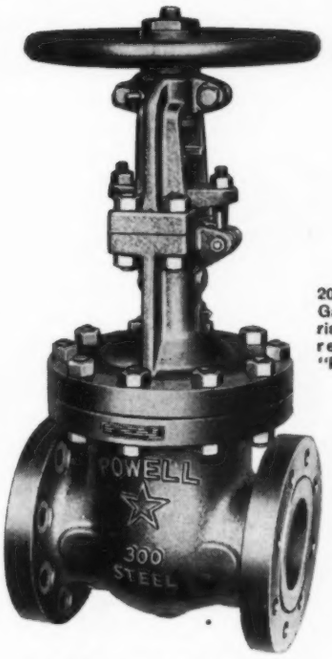
Let POWELL guide your way to assured, unfailing flow control

Through the ages, men on land and sea have been guided to their destination by the *North Star*. It is easy to find because it is almost in line with the two stars on the right end of the "Big Dipper."

Many years ago Powell patented the famous "Star" Regrinding Globe Valve. Today, the *Powell Star*, backed by 100 years of accumulated technical knowledge and manufacturing skills, is serving Industry as a guide to assured, unfailing flow control. The Complete Powell Line includes valves for every known industrial service and as new demands arise Powell Engineers will design valves to meet them.

Catalogs gladly furnished on request. Kindly specify whether you are interested in Bronze, Iron, Cast Steel, or Corrosion Resistant Valves.

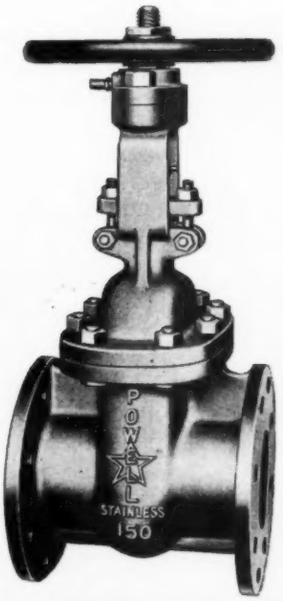
200-pound Bronze "White Star" Gate Valve with inside screw rising stem, union bonnet and renewable, wear-resisting "Powellium" nickel-bronze disc.



Class 300-pound Cast Steel Gate Valve with bolted flanged yoke, outside screw rising stem and taper wedge solid disc. Powell Cast Steel Valves of all types are available in pressure classes from 150 to 2500 pounds, inclusive.

200-pound Bronze "White Star" Globe Valve with union bonnet, renewable, stainless steel seat and regrindable, renewable wear-resisting "Powellium" nickel-bronze disc.

Large Iron Body Bronze Mounted Globe Valve for 125 pounds W. S. P. Sizes 2" to 16", incl. Has outside screw rising stem, bolted flanged yoke, and regrindable, renewable bronze seat and disc. Also available in All Iron.



Standard 150-pound Stainless Steel Gate Valve with outside screw rising stem, bolted flanged yoke-bonnet and taper wedge solid disc. Made in sizes 2½" to 8", inclusive.

The Wm. Powell Co., Cincinnati 22, Ohio

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

POWELL VALVES

AREA OF LEAK	AIR		STEAM		WATER	
Diameter Inches	Number of cubic feet per month at 75 lb. pressure	Total cost of waste per month 11c per 1000 cubic feet	Pounds wasted per month at 160 lb. pressure	Total cost of waste per month 65c per 1000 lb.	Gallons wasted per month at 60 lb. pressure	Total cost of waste per month 16c per 1000 gallons
1/2"	13,468,000	$1,481.44	1,219,280	$792.53	1,524,100	$243.86
3/8"	7,558,500	831.44	684,290	444.79	855,360	136.86
1/4"	3,366,990	370.37	304,820	198.13	381,020	60.96
1/8"	824,570	90.70	74,650	48.52	93,310	14.93
1/16"	213,000	23.43	19,280	12.53	24,110	3.86
1/32"	52,910	5.82	4,790	3.11	5,990	.96

What does it cost you each month *for air, steam, water, you never use?*

Fig. 1640 "King Clip" Gate

Maybe you've never checked the actual cost of valve leakage. If you haven't, you'll doubtless be startled at these figures.

A single valve leak the size of a pinhead can waste enough air in a month to approximate the cost of a new valve. Steam leaks . . . water leaks . . . also take a heavy toll if neglected . . . not to mention the wastage of such a critical item as fuel.

Where Lunkenheimer Valves are given ordinary care, such losses are held to an absolute minimum. These quality-built valves are designed to give extra long service with the lowest possible outlay of time, labor, and money, for maintenance. Enlarged copies of the above chart for posting in your plant are available on request. Also available are the services of your nearby Lunkenheimer Distributor, who is fully equipped to assist in solution of your operating or maintenance problems.

The Lunkenheimer Co., Cincinnati 14, Ohio, U.S.A. (Branch Offices: New York 13, Chicago 6, Boston 10, Philadelphia 7. Export Department: 318-322 Hudson St., New York 13, N. Y.)

Fig. 16-P Bronze Globe

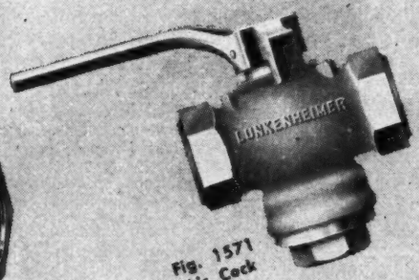


Fig. 1571 Air Cock

LUNKENHEIMER VALVES

BRONZE, IRON, STEEL AND CORROSION RESISTANT ALLOY VALVES, 125 TO 2500 LB. S.P.; BOILER MOUNTINGS, LUBRICATING DEVICES, AIRCRAFT FITTINGS

difference between this case and earlier ones lies in the fact that here there was a complete absence of any other unfair labor practice or unfair opposition to the union. (M. T. Stevens & Sons Company, NLRB)

*MANAGEMENT'S RIGHT TO PREFERENTIAL HIRING

Management was granted the exclusive right to reject job applicants supplied by the union where the contract provided for a preferential hiring clause that made employment subject to the satisfaction of the company with respect to the applicants' qualifications. The clause from which management derived such right provided that, in the event vacancies occur, the company shall notify the union of the same and the union shall be given an opportunity to supply help *satisfactory to the company* to fill such vacancies.

As pointed out by the arbitrator in upholding the company's position, the employer's business might be seriously impeded by a delay in production caused by the union's questioning of its decision, since the business is a seasonal one and its employment needs are urgent as indicated by the contractual provision for supply of help within 3 hours from the union. (In re Arbitration between Good Humor Corporation and International Brotherhood of Teamsters, Chauffeurs, Warehousemen, & Helpers of America, Local 680)

*PICKETING NOT ENJOINABLE

Peaceful picketing, when it is conducted for the purpose of inducing employees to join the union, may not be enjoined under the Oregon State Anti-Injunction Act. The employer operated an open shop, with no discrimination between union and non-union members. The union in this case originally demanded a closed-shop contract, even though it represented none of the employees in the plant. However, a state supreme court held that the picketing in this instance was for a legal purpose—namely, to induce employees to join, and could not therefore be enjoined. (Peters v. Central Labor Council, Ore. Sup. Ct.)

*REFUSAL TO WORK WITH NON-UNION MEMBERS

When a contract provision states that union members shall not be required to work with non-union employees covered by the same agreement, an arbitrator held that such a provision does not sanction the right of union members to refuse to work with non-union employees of an outside company which does business with the employer. The clause applies only to conditions within the plant itself, and cannot be construed to mean otherwise. (In re Arbitration between Borden's Farm Products, Inc., and International Brotherhood of Teamsters, Chauffeurs, Warehousemen, & Helpers of America)

*DISCHARGE HELD DISCRIMINATORY

The discharge of a foreman was held discriminatory by the NLRB, where the fore-

DAY-LINE*

The "ONE-MAN" *Fixture*

This heavy-duty Day-Brite Industrial Fluorescent system saves time and money on every installation —every service operation:

- One man *alone* can quickly hang the Day-Line with chain or patented Day-Brite "Ice-Tong" hangers.
- Rugged, die-formed steel channels designed for simplified unit or continuous mounting—plenty of knockouts.
- Lifetime porcelain enameled steel reflectors fastened with two captive wing nuts can be removed and replaced in one minute for easy installation and servicing—*without tools.*

Day-Brite Lighting, Inc., 5441 Bulwer Avenue, St. Louis 7, Mo. Nationally distributed through leading electrical supply houses.

In Canada: address inquiries to Amalgamated Electric Corporation, Ltd., Toronto 6, Ontario.

* Patent Nos. 2317434, D135375, D133458

944

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DAY-BRITE *Lighting*

Do You Need **DIRECT DRIVE ON BASE?**

Built-in Motor Drive mounted on steel base is compact and easy to install. No foundations necessary.

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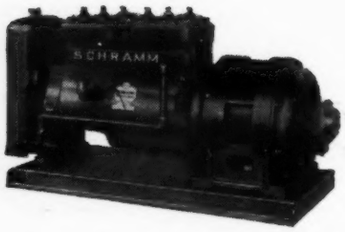
DIRECT MOTOR DRIVE WITH COOLING UNIT?

Schramm 300 cu. ft. displacement with direct-connected 50 H.P. motor with cooling unit on Steel Deck Base.



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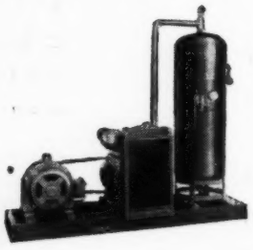
mounted and ready for immediate installation? Belt Drive complete with motor, vertical air receiver and cooling unit all mounted on a single base.



SCHRAMM offers you a complete line of Air Compressors for your every need! Sizes range up to 600 cu. ft. displacement! Schramm's stationary units are widely used in plants throughout the country, and are specified because they are vibrationless, lightweight, compact . . . and at the same time easily furnish a steady flow of air. Write today for full details on Schramm Air Compressors.

SCHRAMM INC **THE COMPRESSOR PEOPLE**
WEST CHESTER
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man was an active member of the union which represented the rank-and-file employees. The board ruled that even though the employee was a supervisor, the employer was not relieved of his obligation not to engage in discriminatory conduct to discourage union membership. However, since the union had been organized by, and had secured its majority through, the assistance of this supervisor, the complaint of refusal to bargain with this union was not sustained against the employer. (Wells, Inc., NLRB)

*BACK PAY REDUCED

Back pay, due two supervisory employees whose discharges were found to be violations under the Wagner Act, was reduced for the 3-month period in which the board had instructed its regional offices not to process unfair labor practice charges involving discrimination against supervisory employees. Prior decisions have held that the employer shall be penalized for delays caused by the board, but this case differs in that the delay was caused by specific board instructions. (American Steel Foundries, NLRB).

*ABILITY TO PAY CONSIDERED IN AWARD

Handing down an unusual decision, an arbitrator awards a union a compromise settlement on its wage demands, a settlement which was tempered by consideration of the employer's financial position.

The union had set forth several demands—namely, a general increase of 25 cents per hour; one week's paid vacation after one year of service; 6 paid holidays. The company offered a general increase of 10 cents per hour.

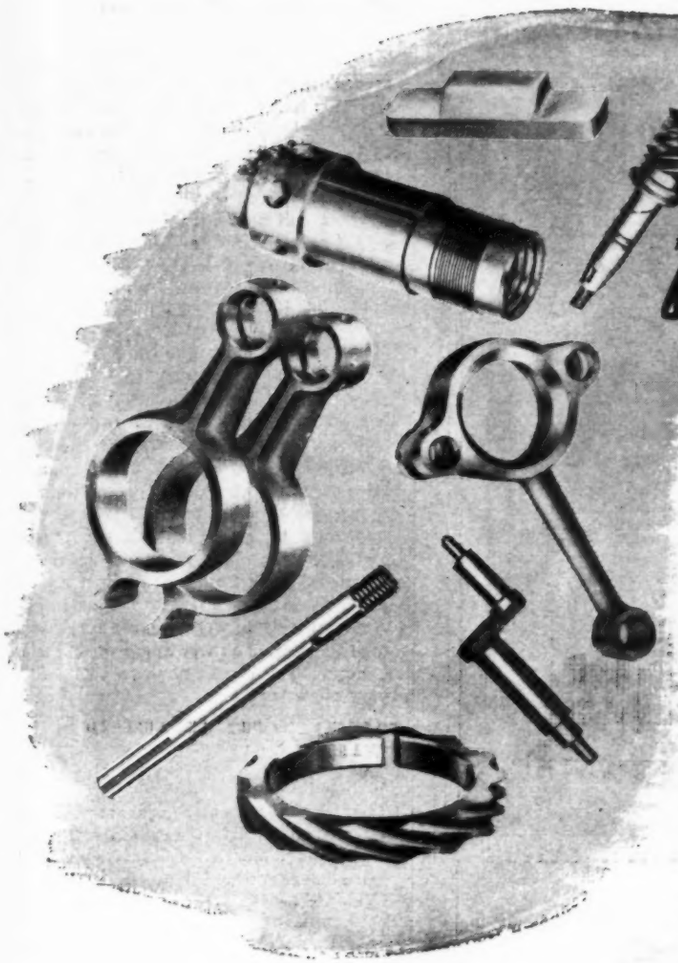
The union contended that its demands were well within the patterns established for plants in the area. The company, agreeing to 10-cents-per-hour increase and one-week's vacation after one year, denied the other demands on the ground of an unfavorable financial position.

The arbitrator, while recognizing that the low hourly rates should be corrected and that cost-of-living changes should be compensated for, pointed out that direct labor costs of the company were already 40 percent of total costs and that the increased wages, as demanded by the union, would eliminate the small profit margin under which the employer was presently working.

The union's request for one week's vacation after one year was granted by the arbitrator. However, the demand for 6 paid holidays was denied *solely on the basis of the financial position of the company*. And a general increase of 15 cents per hour was granted, 10 cents to be retroactive to the beginning of the year and the remainder to be effective as of the date of the award. (In re arbitration between Scranton Metal Casket Works and Local Industrial Union 1529)

*CALL-IN PAY

Call-in pay was granted employees who were permitted to report to work but were



TOUGH BEARINGS

600 Forgeable Bearing Alloy contains no tin, but has superlative bearing qualities.

Preference Order M-43 prohibits the use of more than 2% of tin for many types of products. Wrought or Cast Bronzes needed for bearing or wearing surfaces require 5% or more of tin. "600" Alloy contains no tin, but fulfills the same services. Its use, therefore . . . for many applications, nullifies any hardship which might result because of this limitation.

"600" Bearing Metal is the solution to many difficult bearing problems. It is for the "hard to crack" applications. It can be drawn or forged, and readily fabricated into a great variety of sizes and shapes.

"600" Metal is approximately three times stronger than the best cast bearing bronzes, and develops a lower temperature under heavier loads and higher speeds. Extreme pressure lubricants do not corrode it.

Hundreds of thousands of pounds of "600" Bearing Alloy are being used in a number of the new 1946 cars and trucks for such purposes as transmission gears, gear shifter forks, idler pins, etc.

"600" Bearing Alloy is easy to machine, having a relative machinability of 90%, using as a base SAE 1020 steel at 100%.

If you have a bearing problem, write us for additional, complete information.

SOME OF THE MANY APPLICATIONS FOR WHICH 600 METAL IS IDEAL . . .

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GEAR BLANKS	CAMS
SPINDLES	DRAWN RODS
SEAL RINGS	THRUST WASHERS
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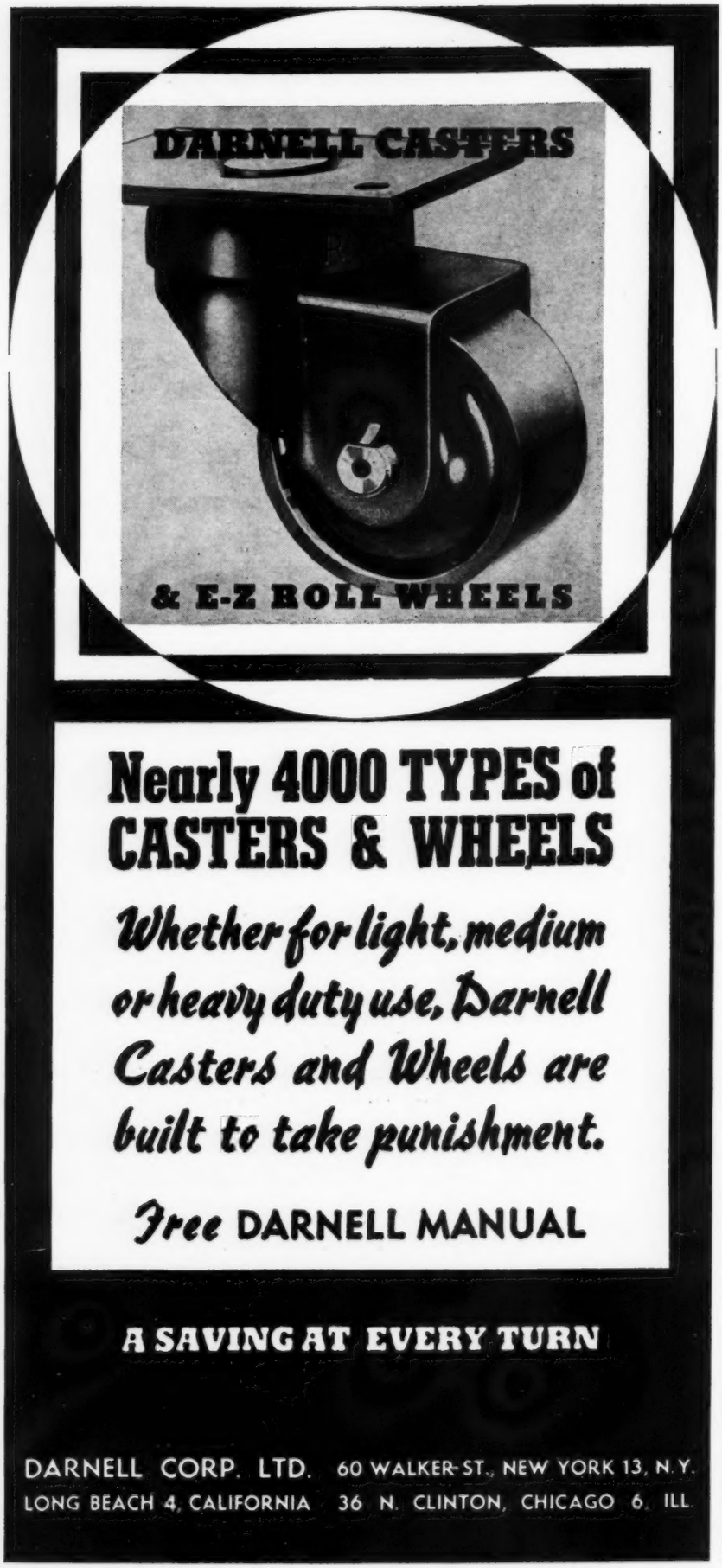
WORM GEARS	PROPELLER SHAFTS
CONNECTING RODS	

600 BEARING METAL

MUELLER BRASS CO.
PORT HURON, MICH.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informed, upon reporting, that no work was available for them, despite the fact that the employer contended that the employees were not entitled to pay since they were on strike. This company's contract provided for 4 hours' call-in pay. The employer's contention that a strike was in existence was based on the fact that a picket line was placed in front of the plant and a sign "on strike" was displayed on the company's fence.

The arbitrator found that the employees involved did not strike against their employer in violation of the contract, but that the pickets and sign were placed by other groups of workers in the same local union but under other contracts with different employers. As the arbitrator stated, the company was not at fault and should not be penalized if it acted properly within the terms of the contract and, conversely, the employees were not at fault and the employer had directed its employees not to report for work until called, then no obligation would have arisen. But the employees did report to work, having received no notice to the contrary, and were therefore entitled to 4 hours' pay for each of the days they reported, since, when they reported, they were advised that there was no work available. (In re arbitration between Sinclair Refining Company, and Oil Workers' International Union, Local 346)

RETRACTION OF HOLIDAY ALLOWED

An employer, who voluntarily granted employees a half-holiday a week, and then revoked the order, was not held to have discriminated against his employees. The order was not part of a contract nor the result of collective bargaining, but purely voluntary, and therefore the employer was not liable for any loss on the part of employees because of the revocation of the order. (NLRB v. Palm Beach Broadcasting Corporation, CCA 5)

UNEMPLOYMENT COMPENSATION WHERE JOB IS REFUSED

Whether an individual has legal claim to unemployment compensation when he refuses employment in an open shop because the union of which he is a member prohibits his working with non-union employees, was the question presented to two state courts, which arrived at contradictory solutions. Ohio and Pennsylvania, the states involved, both have unemployment compensation laws providing unemployed workers with benefits provided they do not refuse to accept suitable employment without good cause. Both laws also provide that the unemployment benefits need not be forfeited if, "as a condition of being so employed," the employee must join or resign from a *bona fide* labor organization.

Despite the similarity of the statutes in both states, the courts reached divergent opinions. The Ohio Supreme Court rejected the employee's claim on the power and authority to determine that a member should not accept refusal to work and thereby qualify him for unemployment compensation to which he would otherwise not be entitled because of refusal of such a

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The Railroad Research Bureau of U. S. Steel Corporation has designed an all-welded steel coal car that eliminates 15% of dead weight.

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B. F. Goodrich announces a new "white carbon black" which will permit the making of white and colored tires.

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Lockheed Aircraft Corporation is testing its "Speedpak," a streamlined metal container that fastens to the underside of an airliner and holds four tons of cargo.

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Westinghouse has patents on a new fluorescent lamp that resembles an incandescent bulb and uses arsenic in place of mercury.

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Du Pont is developing a method of porcelain enameling aluminum.

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A 2-horsepower electric motor, weighing only fifteen pounds, is made by Electrical Engineering & Manufacturing Corporation.

Myles Plastics Corporation of New York claims to have methods and compounds by which small, simple plastic parts can be molded cold at rates of 25,000 per hour or better.

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Chestnut trees, the chief source of leather tanning agents, are threatened by blight, but Monsanto chemists are working on a synthetic tan to take its place.

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The new semi-automatic machines of General Tire and Rubber Company can turn out a tire every two minutes, which is about twice the usual output.

A vacuum-draft oil burning furnace that does not require the conventional type of chimney was shown by the Norge Division of Borg-Warner Corporation at the Oil Heat Exposition.

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Cranberry Canners Inc. of Cape Cod will test a mechanical cranberry picker this fall. It is expected to increase the yield per acre and double the rate of harvesting.

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The United States Patent Office is sorting and evaluating 10 tons of Nazi patents brought here from Germany.

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Great deposits of bauxite have been located in Oregon, conveniently near the hydroelectric plants of the Pacific Northwest, by the Oregon State Department of Geology and Mineral Resources.

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for You

This 9½" wrench handle is made of SAE 4130 ¾" round stock. Twelve operations are completed within the tolerances specified in 55 seconds. The Conomatic, an innovation in the 8-spindle field, has led in the handling of work hitherto thought impractical including pieces up to 25 ⅝" in length.

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149	$1.00	$1.00	$1.00	$1.23	3.07¢
349	1.02	1.18	2.30	3.68	9.21¢
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referral. Statutory protection of workers who refuse to join or resign from a union was intended only where the employer imposes such a condition of employment, not the union. A contrary ruling, the court maintains, would impose discriminatory treatment on non-union employees. (Ohio Supreme Court)

The Pennsylvania Superior Court, in upholding the employee's claim, declared that refusal of employment for such cause constitutes "good cause" and may not be used to deprive the employee of unemployment benefits. As stated by the court:

"The bundle of rights which membership in a union confers upon its members—among them, the privilege of engaging in collective bargaining, the interest in sick and death benefits, and the opportunity to obtain and retain work at union rates—is property, so valuable and so thoroughly established by law, that equity will restrain its impairment. . . . The member, however, holds title to this property upon the express condition that he comply with the duties and obligations imposed upon him by the constitution, bylaws, and the properly adopted rules of the union, and he loses it by his failure to meet the conditions of membership. Equity will not intervene to save for him the property he has forfeited by his failure to comply with them."

*COURT WILL NOT REWRITE CONTRACT

On the plea that there was a mutual mistake of law in the wage contract, an employer sought to reform his wage contract so as to include the time spent by plant guards in preparation for work in existing wage payments. The circuit court upheld the employees' suit for back pay due for the time spent in preparation, on the ground that a mutual *bona fide* mistake did not exist, since the guards had not discussed wages with him, had not participated in the drafting of the contract with him, and had no other alternative but to accept the terms of the contract or not work. The employer's contention, that the employees' acceptance of the wage adjustment when the Act became effective (provision was made for overtime for work in excess of the statutory maximum) made the mistake mutual, was rejected by the court for the aforementioned reasons. (Yellow Truck & Coach Manufacturing Company v. Edmondson, CCA 6)

*STRIKE AGAINST STATE PENALIZED

A recent law enacted in Virginia provides that any employee of the state who strikes against the agency in which he is employed, shall be ineligible for employment in any state position for 12 months thereafter. Employees may appeal such action within 90 days after notification of suspension of their employment rights. (Virginia Strike-Control Act)

*DISCHARGE HELD NOT DISCRIMINATORY

The discharge of an employee for insubordination at the time he joined the union was

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PLASTICS . . . FOR THE CREAM IN YOUR COFFEE

THE HEART of a cream separator, which works by centrifugal force, is a set of 23 or more whirling discs. They must be odorless . . . tasteless . . . easy to remove and clean.

The problem of making cream separator discs out of plastics —the first ever used—was solved by General Electric's *complete* plastics service for the Galloway Co., Inc., Waterloo, Iowa.

Laminating and molding gives the plastics disc the required mechanical strength, a high finish, and above all, a shape that can't be distorted to cause vibration in the cream separator. And plastics, of course, give important chemical resistance to lactic acid and the corrosive cleaning solutions used by dairymen with such frequency.

Perhaps you, too, could use the chemical resistance of a plastic part to good advantage in your product. Bring this, or any other plastics problem, to General Electric—the world's largest manufacturer of finished plastics products. Write to the Plastics Divisions, Chemical Department, General Electric Co., 1 Plastics Ave., Pittsfield, Mass. *Ask for the new illustrated booklet, "What Are Plastics?"*

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Backed by 52 years of experience. We've been designing and manufacturing plastics products ever since 1894. G-E Research works continually to develop new materials, new processes, new applications.

No. 1 Plastics Avenue —complete plastics service—engineering, design and mold-making. Our own industrial designers and engineers, working together, create plastics parts that are both scientifically sound and good-looking. Our own toolrooms are manned by skilled craftsmen—average precision mold experience, 12 years.

All types of plastics. Facilities for compression, injection, transfer and cold molding . . . for both high and low pressure laminating . . . for fabricating. And G-E Quality Control—a byword in industry—means as many as 160 inspections and analyses for a single plastic part.

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CD48-A14

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The ability to produce goods and employ people is not the only gauge of industrial enterprise. The real proof is how well are life and property protected against fire. What good is insurance if plants are closed down through fire or improper extinguishing methods? Modern plants install modern fire protection equipment.

When tracings and other valuable records are stored in vaults, warehouses or remotely isolated spaces seldom visited, they should be protected with C-O-TWO automatic smoke detecting equipment combined with a C-O-TWO five extinguishing system. At the slightest whiff of smoke an alarm sounds; doors and windows are automatically closed by C-O-TWO pressure release, to isolate the area; then dry, sub-zero, carbon dioxide gas, a non-damaging, fast, positive extinguishing agent, smothers the fire in seconds. And there will be no damage to material or equipment when this modern C-O-TWO method stands guard. You are back in production in a few minutes. Write today for information.

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held not to have constituted an unfair labor practice, in that the discharge had been delayed because of the wartime manpower shortage. The fact that the discharge came at the time he joined the union was merely coincidental, the court concluded. (Rochester-Penfield Bus Company, v. N. Y. Labor Board, N. Y. Sup. Ct.)

*ARBITRATOR REMOVED FOR BIAS

The removal of an arbitrator, appointed to settle a dispute between an employer and a union was held justified by a court of appeals because of his partisanship toward labor. The New York Supreme Court, which appointed the arbitrator and later removed him, stated that although the latter's honesty and integrity were not questioned, nevertheless his past actions strongly indicated partisanship toward labor. (Western Union v. Seely, Court of Appeals, N. Y.)

REPRESENTATION PROCEDURE

In a presentation proceeding, the board no longer requires that the NLRB regional agents report on the *prima facie* showing of interest on the part of the labor organization claiming to represent the employees, be introduced in evidence. However, this change does not affect the requirement that a labor organization, seeking a determination of representation, must show substantial interest to the Board's regional agents. (O. D. Jennings & Company, NLRB)

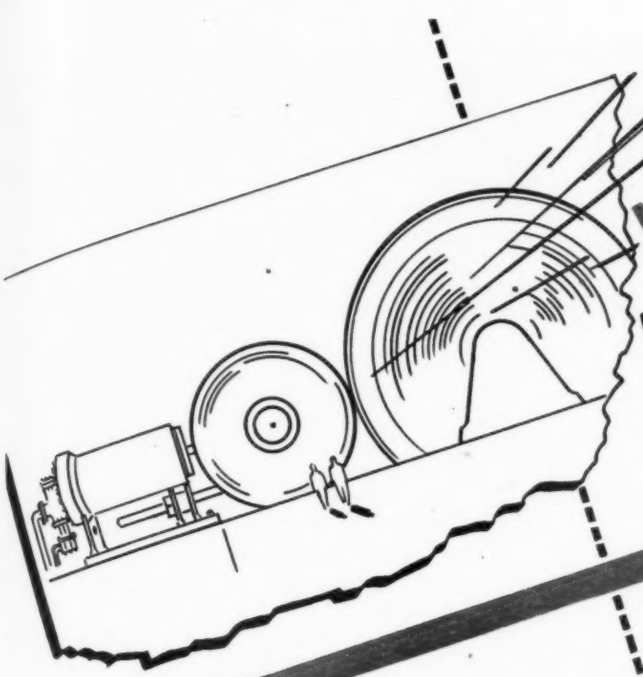
REPRESENTATION DENIED

Bargaining rights were denied guards at an ordnance plant, although they were not militarized. The court denied bargaining rights to the guards on the ground that they were not employees of the contractor involved, since they were hired on demand of the government, the contractor was reimbursed for the pay of the guards, and employment conditions for the guards were partly established by the government. (NLRB v. Atkins, CCA Chicago)

*APPROPRIATE UNIT

Time study men are an appropriate unit for bargaining purposes, the NLRB rules. Even though the employer claims they are "managerial" and "confidential" employees, it was found that they had no supervisory authority, nor did they take part in formulating management policies. Their chief function is that of fact-finding, and they should not be denied bargaining rights. (Brown & Sharpe Manufacturing Co., NLRB)

In the past, it has been the policy of the N. Y. Labor Relations Board to designate only store-wide units as appropriate bargaining units for sales personnel in department or retail specialty stores, but the board recently held that a smaller unit of salespeople was appropriate for bargaining purposes. Although the company held that only an over-all unit of salespeople was appropriate, the board declared otherwise, in that the salespeople in the women's shoe departments had different hours, a different wage pattern, a high degree of skill and ability, and had been organized for some time past. (Saks & Company, NLRB)



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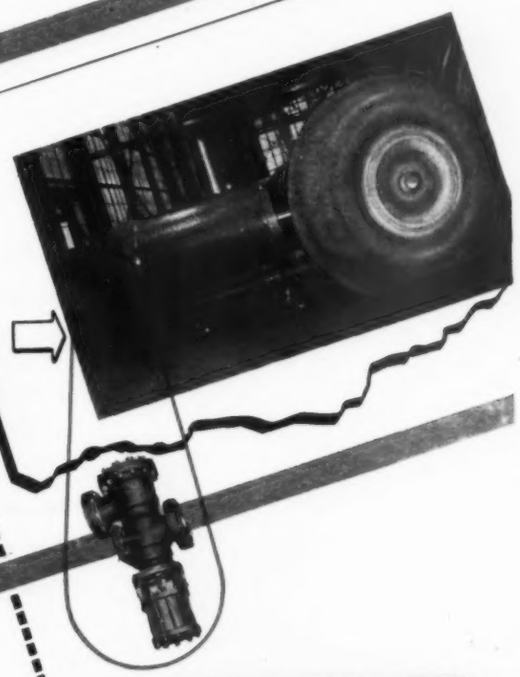
500 pounds of Compressed Air Smacks Giants Together

Large 6" Quick-As-Wink Valve Handles 500 Pound Air

Three Quick-As-Wink valves help control the 500 pound air pressure needed for this inertia brake and tire testing machine. The 6" valve controls a single acting cylinder . . . a 3" valve exhausts the 42-inch cylinder, which is then reversed by applying 200 lbs. of air to small pull-back cylinders through a 2" single plunger valve.



This inertia brake and tire testing machine assimilates conditions of a loaded bomber or passenger transport coming in for a landing.

To explore the effects of heat and pressure of the tremendous impact when wheel hits runway, this machine applies the tire to the spinning 16 foot flywheel.

The setup requires 500 pound air pressure applied to a single acting air cylinder of 42" diameter by 50" stroke. To control the extreme pressure, C. B. Hunt & Son, Inc. designed and built a 6" air valve . . . an unusual valve handling 500 pound air pressure.

Adamson-United Co., Akron, Ohio, which engineered and built the brake and tire testing assembly for Wright Field, Dayton, Ohio, called in C. B. Hunt & Son, Inc. to recommend and construct the proper type of valve.

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We manufacture solenoid, hand, foot, and diaphragm operated air valves, and a complete line of hand and pilot operated hydraulic valves for water and oil. We make a full line of hand and pilot operated hydraulic valves for pressures as high as 5000 pounds.

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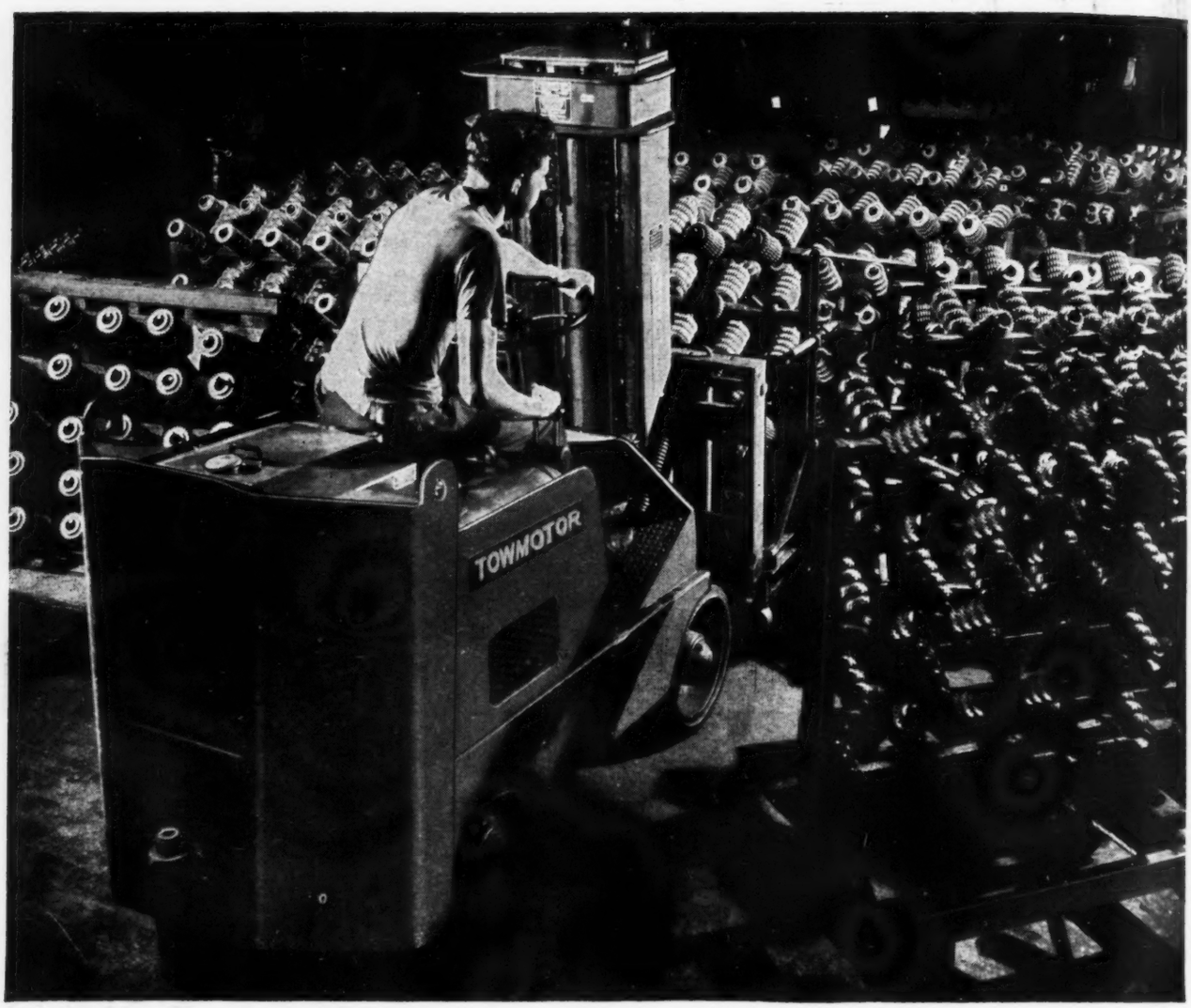

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In the shipping department, two Towmotors load 250,000 lbs. of gears daily, in addition to supplying loads for three interplant trucks. And to Towmotor's record for versatility and capacity can be added economical operation . . . operating costs for each unit total only one-quarter of the operator's wage.

For every handling problem, however unusual, there is an engineered solution . . . a solution based on Towmotor experience and "know-how" gained in solving handling problems in every industry. Send for your copy of the Towmotor Lift Truck ANALYSIS GUIDE. Towmotor Corporation, 1238 East 152nd Street, Cleveland 10, Ohio.

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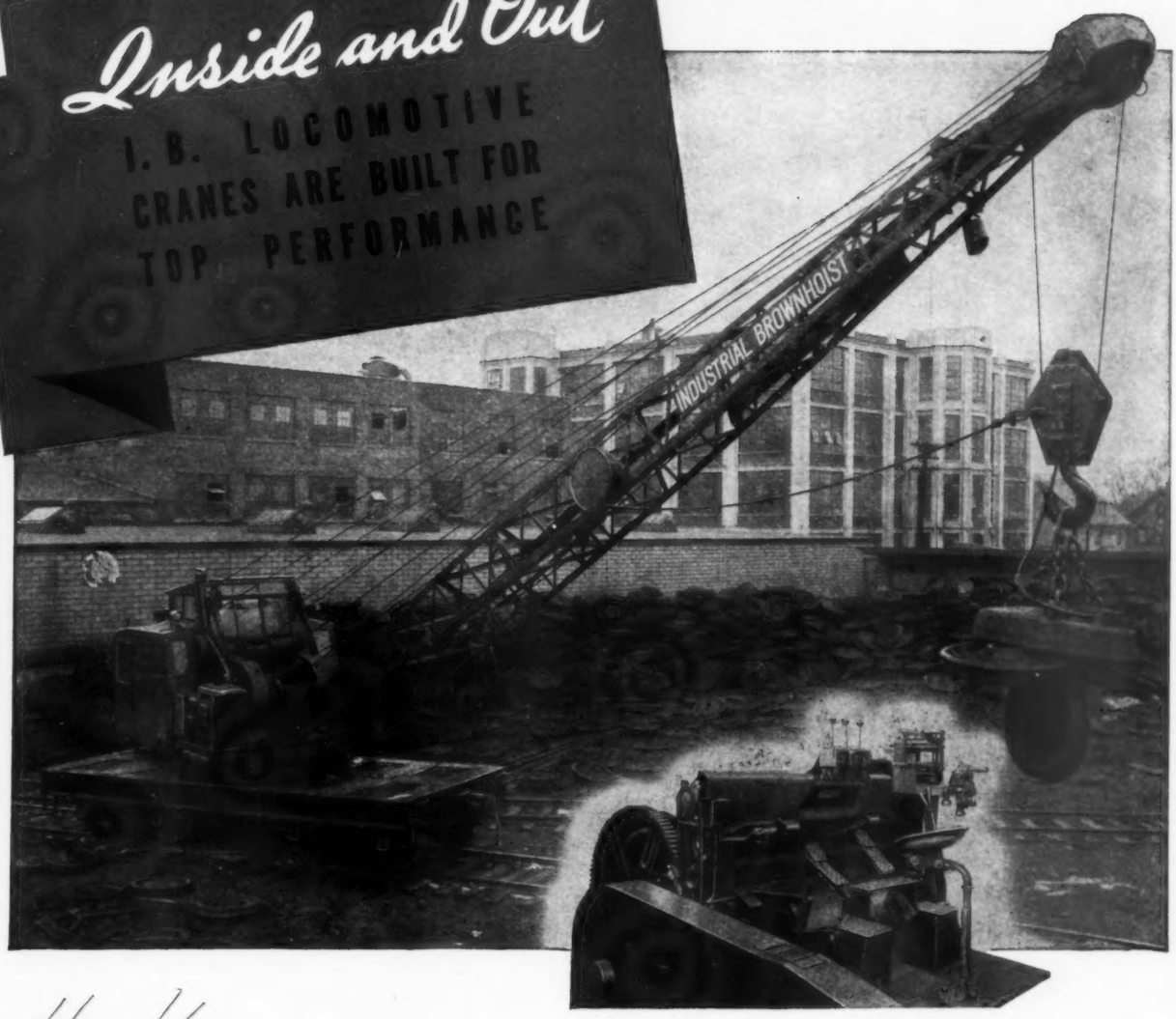
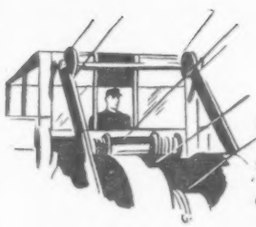
I. B. LOCOMOTIVE CRANES ARE BUILT FOR TOP PERFORMANCE





Inside and out, Industrial Brownhoist Locomotive Cranes have the design and construction features necessary to handle materials with the greatest ease and all-round economy. Air and manual controls, placed within quick, easy reach of the operator, provide the sure, sensitive response that makes lifting and spotting the heaviest, bulkiest materials a routine job. Anti-friction bearings at all essential points minimize maintenance. One-piece cast steel bed insures rigidity of mechanism thus prolonging crane life. Rotating and travel friction disc clutches with one-point adjustment reduce wear and strain to mechanism. Monitor type cab gives safe 360° visibility. These are only a few of the many reasons why I.B. Locomotive Cranes give you top performance in dependable, economical materials handling with magnet, hook, or bucket. Write for complete particulars.

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This STOW Flexible Shaft Machine is PORTABLE and ADJUSTABLE!

... More ADAPTABLE to a Greater Number of Jobs!

The height of model N STOW flexible shaft machine is adjustable so as to increase the number of positions in which it can be operated. Swivel mounting of the motor also adjusts the unit to the angularity of the work. Base of the machine is of sturdy four-legged construction with caster mounting and ample spread for stability.

Roll one of these STOW machines up to any operation—grinding, sanding, brushing, buffing, polishing, filing, or drilling, and watch labor costs and production time fall.

Now! flexible shaft motor attachment.

Ready to attach to any spare motor, here's a worksaver that will perform countless jobs —rasps, polishes, sands, files, wirebrushes, etc.

STOW MANUFACTURING CO.
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they say and do

SIGNPOSTS TO GOVERNMENT CONTROLLED ECONOMY

HERMAN W. STEINKRAUS, participating in "America's Town Meeting" Radio Forum

There is nothing new about a government planned economy. History is full of such attempts, all resulting in 100 percent failure even when the very best of intentions were involved. No real American wants that kind of government, but I fear we may wake up and find that we have something in a complete picture far different from the way individual pieces appeared before they were put together.

We can tell whether we are going in the direction of a government controlled economy by looking at the roadsigns along the way. Here are four definite signs pointing in that direction:

First, the government has control of the finances of the nation. It controls the money and the rate of interest on savings, and exercises other controls through confiscatory taxation. Through its inflationary monetary policy and its low rate of interest it is making the people's money worth less and less. Through heavy rates of taxation on both personal and corporate income, and through high inheritance taxes, it controls the earnings and income of all people.

The second roadsign is the government's control of production, employment, and labor. Long before the war our government controlled the production of the farmer. Government still controls farm production today partly through large subsidy payments.

Industrial production is also very much under the control of the government through a wide variety of regulations.

As to employment, the hotly contested Full Employment Bill was surely a step toward government controlled economy. The government cannot guarantee jobs to everyone unless it also controls everyone. If you expect someone else to provide for you, he must not only have the responsibility but also the authority over you. As to government control over labor, no more drastic control has ever been attempted than the President's proposed bill saying "work or be drafted."

The third roadsign of a government controlled economy is the control of prices. Here is an appealing subject for many citizens. They are glad to have the government control prices, not only through the war but indefinitely. History shows, however, that this leads sooner or later to the government controlling all phases of economic life. But in actual practice government is not as efficient as private enterprise. It does not have to be in a bureaucracy.

Many people do not know the extent to which our government is allocating materials, determining the quality of what is to be produced, controlling the details of the construction industry, regulating every price schedule for the purpose of profit control. So this third roadsign, control of prices, which actually includes the control of profits, is firmly in the hands of our government today. But you may say, "This is only due to the change from war to peace."

That may be true, but only in part. Anyone who studies the whole pattern certainly knows there are many in our present government who want, and are fighting for, permanent control of all these things.

PROPAGANDA—GOOD AND BAD

The fourth great force used throughout history by any group aiming for government control of the economy is the use of propaganda. Before the war European dictators were skilled in the use of propaganda. Our government has expanded the use of propaganda a thousandfold in the last few years. Government programs to farmers, government programs to housewives, to workers, to veterans, to almost every strata of American society, are heard every day.

Helpful information is given to the American public in this way, but much effort is also made to sell the benefit of government controls as well as other philosophies which help to shape the thinking of the people, so that the public will accept ideas that were formerly not considered American. People have been persuaded that the government owes them security, happiness, and freedom from almost everything—including work.

Some American people may think they want all these things, and can get them for nothing. The only trouble is that never in world history has a government controlled economy succeeded. Each one has fallen of its own weight and pulled the people down into the depths of poverty before they were

Our hands are TIED, too!

There's no secret about the fact that reconversion has hit serious snags. There's no one in industry that has escaped the chain of events which tied our hands.

Back in '41 and '42, and all during the war emergency, Levinson Steel Sales was able to maintain fairly comprehensive inventories. By anticipating requirements we were usually in position to adequately serve our customers in war industries.

But in the present situation we have had no such opportunity. As with others in our industry, our inventory is at its lowest ebb. Hence we cannot offer our customers the usual wide range of items which they have been accustomed to expect from us.

We ask only that you understand our position, and that you believe us when we say *we are striving to do our very best under unusual conditions.*

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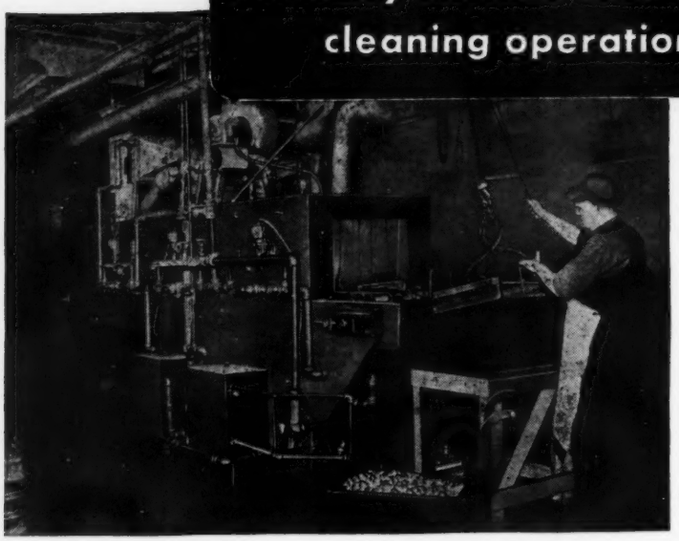

OPTIMUS Flat Conveyor Type Spray Washing Machine handling brass screw machine parts and castings in bulk in large metal working plant.

THE OPTIMUS Flat Conveyor Type Spray Washing Machine will handle metal parts of almost any shape. It can be adapted to many different and difficult metal cleaning problems.

The output of this OPTIMUS Machine is high, with little labor required for loading or servicing. Most types of parts can be easily handled in it in bulk in baskets or separately on the conveyor. Special parts can be positioned, if necessary.

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Write today on your business letterhead for your copy of this new illustrated bulletin describing OPTIMUS Equipment and Dependable OPTIMUS Detergents for modern metal parts cleaning operations.

Handling a large amount of cleaning per square foot of floor space, this OPTIMUS Machine can be used for any metal cleaning or similar operations; alkaline, acid, solvent type, air drying, oil spray, etc. Available in all sizes with any type of horizontal conveyor.

An OPTIMUS Plan for the mechanized handling of your metal parts through washing, rinsing, drying and allied process operations, can help save labor costs, reduce rejects and increase your production. Investigate how the use of OPTIMUS Equipment and the accompanying Dependable OPTIMUS Detergents can be applied to your operations to your advantage.

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through with it. Look at Italy, Germany, and France today. They had government controlled economy.

History has taught us that only one thing can make a nation great and strong. That is a free people, with the government having a medium amount of control over their lives. America is the supreme example. As long as the government acts only as an umpire to see that each individual's freedom of action is protected by law, we have a country where individual initiative and opportunity can grow.

Unpopular as it may be today to criticize any of the grandiose schemes of federal planners, it is nevertheless important before it is too late. Unless the individual citizen takes a greater interest in public affairs today we shall wind up as other countries have, grown soft by promises from a paternalistic government, grown afraid of standing on our own feet and making the best of our own opportunities.

PERIODIC ANALYSIS FOR BETTER ORGANIZATION

E. B. MAPLE, Supervisor, Administration Planning, Carnegie-Illinois Steel Corporation, addressing American Management Association Conference on General Management Problems

Every organization needs to take a periodic look at its own structure. The larger the company, the more important it is that this be done regularly. The task must be done courageously and without regard to personalities. It should always precede any organizational change.

All departmental functions fall into one of four categories: (1) The department *controls* the performance of the function, which includes coordination to attain the company objective; or (2) the department *coordinates* the performance of a function where two or more departments share responsibility for different segments of performance; or (3) the department gives *advice* to the "control" department; or (4) the department performs certain *services* that are necessary in the execution of the function and are done as a service for the department maintaining "control."

There is one governing factor that applies to every company, whether large or small, and that should be paramount in all determinations of organization. The organization structure must be kept as simple as possible. There must be but one person directly responsible for each activity, with only one line of authority controlling each work group. Staff responsibility for function coordination sometimes works, but it can never be a completely effective sub-

To Cut Costs on *ALL FIVE* Basic Types of Surface Grinders . . .

Norton Wheels and Segments

1 VERTICAL SPINDLE — *Cylinder Wheel or Segments* RECIPROCATING TABLE

2 VERTICAL SPINDLE — *Cylinder Wheel or Segments* ROTATING TABLE

3 HORIZONTAL SPINDLE — *Straight Wheel* RECIPROCATING TABLE

4 HORIZONTAL SPINDLE — *Straight Wheel* ROTATING TABLE

5 HORIZONTAL SPINDLE — *Cylinder Wheel or Segments* RECIPROCATING TABLE

LOW production costs are absolutely essential today. And the way to get down to minimum on surface grinding costs is to let a Norton engineer study each of your jobs. He can furnish a grinding wheel or segments for **every** type of surface grinder — and with the grinding action "tailored" to fit your particular requirements.

He has at his command Alundum, 38 Alundum, 57 Alundum, Crystolon, and diamond abrasives; vitrified, resinoid and silicate bonds; — also Norton OPEN STRUCTURE, a feature that is especially valuable for many surfacing jobs.

Get down to minimum surface grinding costs by letting a Norton abrasive engineer study your jobs.

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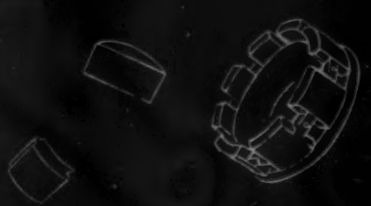

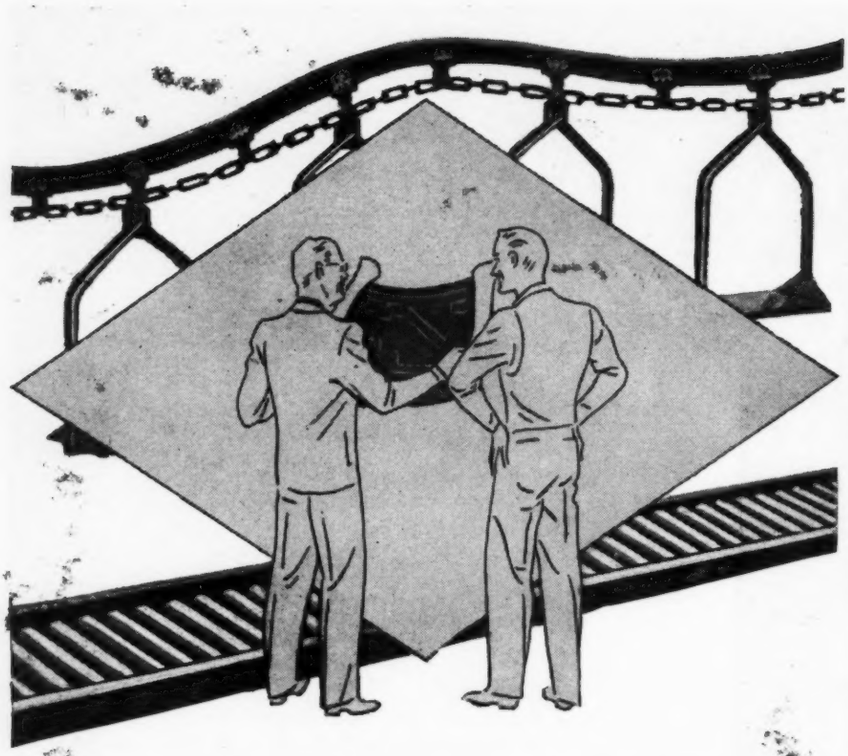

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CORRECT HANDLING of your materials and products requires much more than merely the installation of sections of conveyor. . . . The engineering skill and experience Alvey-Ferguson has acquired during 45 years of installing every type of conveyor system in practically every type of plant gives A-F Engineers a great advantage in designing and installing a plant-wide system for greatest efficiency and economy.

The character of your raw materials and finished products . . . the surface finish . . . the sizes . . . weights . . . conditions under which the system must operate—all these are basic considerations which must be carefully considered.

After such a study the best type of conveyor system needed for your operation is engineered—gravity, power roller, apron, belt, chain, pallet, overhead trolley—or perhaps a combination of several of these types—to co-ordinate all departments, reduce handling expense and set new records in efficient production.

Why not write for a discussion regarding your future materials and products handling—today?

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stitute for straight-line supervision by the line official who has cost or profit responsibility for a company or a department.

Major principles that provide the basis for the planning of administration in advance of action are:

1. Policy must become the boss if we are to avoid treatment of each recurring situation as a new problem requiring executive decision.

2. Management by exception will be practiced by the organization only when policies are kept up to date, which will enable the supervisors to focus their attention on the unusual instead of the routine.

3. Simplification of activities through the elimination of all non-essential functions and details will result in a more effective organization.

4. Adherence to standards is the principal factor in assuring maintenance of a disciplined organization.

5. Description of the playing field for each member of the management team must be subject to continuing review, because of the ever-changing management problems and functions.

6. Two-way flow of consultation and communication must be fostered, encouraged, and stimulated.

7. Indoctrination of the entire organization is a "must" requirement if supervisors and personnel are to understand the framework of established company policies fully, and operate within them.

AFL'S FOUR COMMANDMENTS OF COLLECTIVE BARGAINING

From the AFL Magazine, *Labor's Monthly Survey*

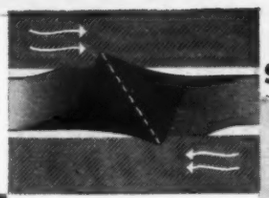
1. Good faith and square dealing on both sides of the conference table. Show your employer that you are seeking a fair and just settlement, satisfactory to both parties. Keep your contract. A broken contract is the mark of bad faith and irresponsibility.

2. Know your industry and know your company. Get such facts as: Costs of operation, outlook for sales and production, particular problems of your company and industry, past profits and prospective profits. Know what a wage increase will cost and what the company can pay. You cannot get these facts from the government. But some AFL unions get this information from their companies for use at the conference table because they have proved that they are responsible organizations, interested in the success of the business, and acting in good faith. Remember

SEMS . . . the cost-saving, pre-assembled washer and screw units . . .

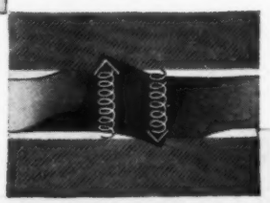
. . . ARE AT THEIR BEST WITH

SHAKEPROOF LOCK WASHERS



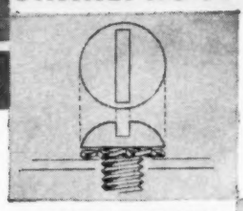
CTION. Each twisted tooth o both sur- setting up a l strut-action ists any back- ovement of

LINE BITE. The exclusive tapered-twisted teeth assure substantial line bite at initial contact. This actually increases under vibration.



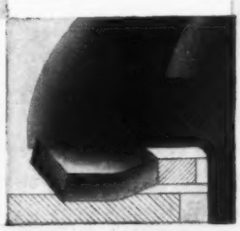
TENSION. As n begins when is put into use, tension forces to bite deep- taining posi-

CHECK THESE SHAKEPROOF ADVANTAGES



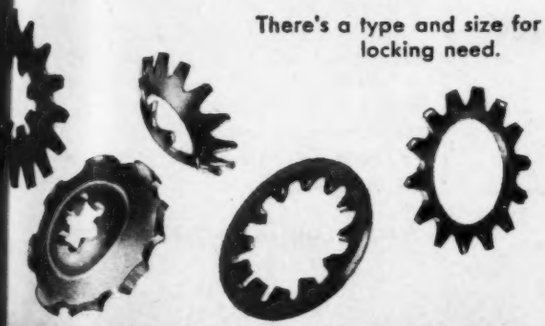
MAXIMUM TOOTH ENGAGEMENT. Shakeproof Lock Washers for SEMS fit closer to screw shank and thus assure maximum tooth contact.

POSITIVE CONCENTRIC SEATING. The Shakeproof Lock Washers used for SEMS hug the screw shank and keep the washer in perfect concentricity; avoids buckling or turning.



You buy the most efficient pre-assembled washer and screw unit obtainable when you order SEMS equipped with Shakeproof Lock Washers for here are all the inherent advantages of SEMS combined with the *ultimate in locking power!* You speed up production, reduce assembly costs and at the same time improve product quality because the multiple tapered-twisted teeth of the Shakeproof Lock Washer actually lock tighter—make the fastening more secure—as vibration increases. Check the advantages illustrated . . . here are five good reasons why you'll want the SEMS you use equipped with Shakeproof Lock Washers. Send for free testing samples today!

There's a type and size for every locking need.



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that your collective bargaining conference is the business of your union and your employer. The company does not want its information released to competitors. Don't injure your company's business.

3. Remember that three groups—workers, consumers, and management—should share the wealth created by American industry. This is the American way forward to higher living standards. Industry's profits should bring (1) wage increases, (2) price reductions, (3) reward for management as an incentive to improve production. Also reserves must be laid aside to buy the new machinery that will increase productivity and make further wage gains possible; and investors must receive enough return on their investment to bring your company adequate financing. You cannot expect all the profit to go into wage increases.

4. Work to improve production per man-hour so there will be more income to share. Have an understanding with the company that workers are to share the increased income they produce and get higher wages. Work out a plan for union-management cooperation. Let your employer know that your union is a strong and responsible organization, that you want to see the business succeed, that you expect to act as a partner in developing it and to share the returns as a partner should.

PUT EMPLOYER RIGHTS IN THE UNION CONTRACT

ALBERT E. MEDER, Attorney, addressing The American Society of Mechanical Engineers

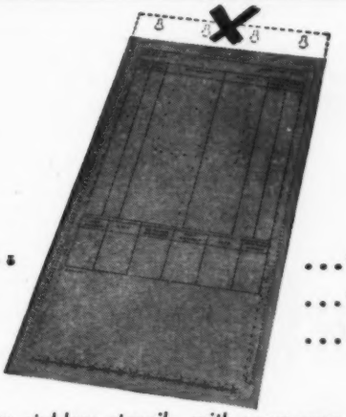
Desirable terms for collective agreements from the management point of view are recommended by Albert E. Meder to obtain a fair day's work for a fair day's pay. His recommendations include:

Have the contract expressly state that the union recognizes the right of the employer to set production standards.

Have the contract define the duties, during their working hours, of union representatives, such as committeemen, chief stewards, and stewards. Otherwise they will roam the plant at will and the employer will get little or no production out of them, to say nothing of the work lost by others, with whom they will be constantly chatting.

Production per man per hour in many plants has fallen off from one-quarter to one-third of what it was prior to World War II. Only a short time ago the demand of labor organizations was "a fair day's pay for a fair day's work." At that time the unions wanted more

Mimeograph stubless die-impressed stencils .....



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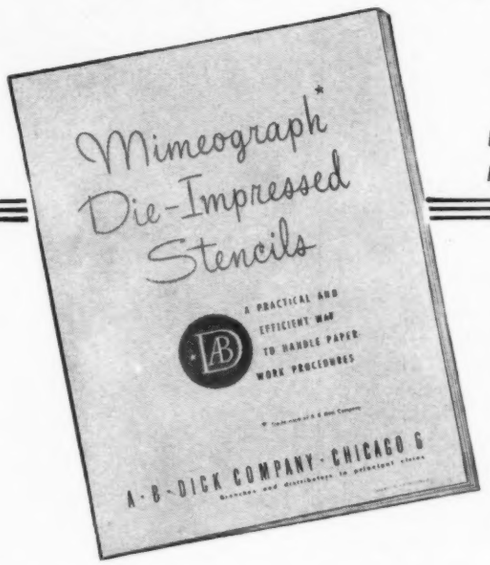

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We have tried to answer the most general ones in this new folder. It explains how Mimeograph die-impressed stencils

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Archer waterproof fabrics are coated to be resistant to alkalies, acids, oils, abrasives, and most chemicals.

Special apparel designed for special needs; also a wide range of coated fabrics for many industrial applications, including Archerite plastic films and coatings.

Ask your Industrial Wholesaler about Royal Archer Work Clothing, or write direct to Archer Rubber Co., Milford, Mass. — Makers of Quality Rubberized Goods Since 1907.

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WORK CLOTHING

money for the workers. But now that wage rates are high, it is the employer who uses the union slogan, changing it to "a fair day's work for a fair day's pay."

Employees either will not work the full 8 hours of an 8-hour shift, or, if they do, they slow down the job. That is the situation today. Many union leaders admit it, realize that it must be remedied, but are so fearful of their union jobs that they refuse to do anything about it.

This is serious. Its effect upon the public will be almost immediate. Prices cannot be kept down if a workman only produces during his working hours three-quarters or two-thirds of what he could produce.

I think we can safely start off with the presumption that by far the greater percentage of the employees in most plants would be willing, if let alone, to get out a fair amount of production and work the full hours of a shift. Also that the object of employers is not to drive their employees unreasonably.

The difficulty is that there is a small minority of employees who apparently believe that the world owes them a living and, in order to get that living, shield themselves behind the cloak of union membership. That minority, noisy and militant, either by coercing other employees or knowing that it is so easy to get the others to follow along, is today in control of the employees in many plants. That minority is led by union stewards and in some instances union committeemen.

As the unions strive more and more to increase the matters over which they claim to have jurisdiction in a plant, even to the extent of insisting that they have a right to object to the subletting of work, for instance, there is considerable to be said for a so-called "company functions" article in a contract.

TRAINING FOREMEN TO BE PART OF MANAGEMENT

FOREST D. SIEFKIN, Vice-President; International Harvester Company, addressing American Management Association

In the Harvester Company, the foreman group is, and always has been, "management" beyond question. We do not look upon our foremen as a buffer state between management and employees. They *are* management men. The distinction between the president and the assistant foreman is a difference in rank and not in status.

We do our utmost to make that status permanent. We do not believe in temporary foremen or temporary assistant foremen. Once a Harvester man is in

WHERE PRODUCTION COUNTS

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HAMMERS and MALLETS

C/R hammers have malleable iron heads with replaceable coiled rawhide faces.

When hammers and mallets must take stern punishment in long, hard service . . . when they must give forceful blows with maximum protection to fine finishes and expensive machined parts . . . it will pay you to insist on *Chicago Rawhide.* Made from tough, resilient, carefully selected hides, C/R hammers and mallets won't crumble, split, mushroom or erase, and they hold their true striking surfaces. Rawhide protects . . . Chicago Rawhide protects most.

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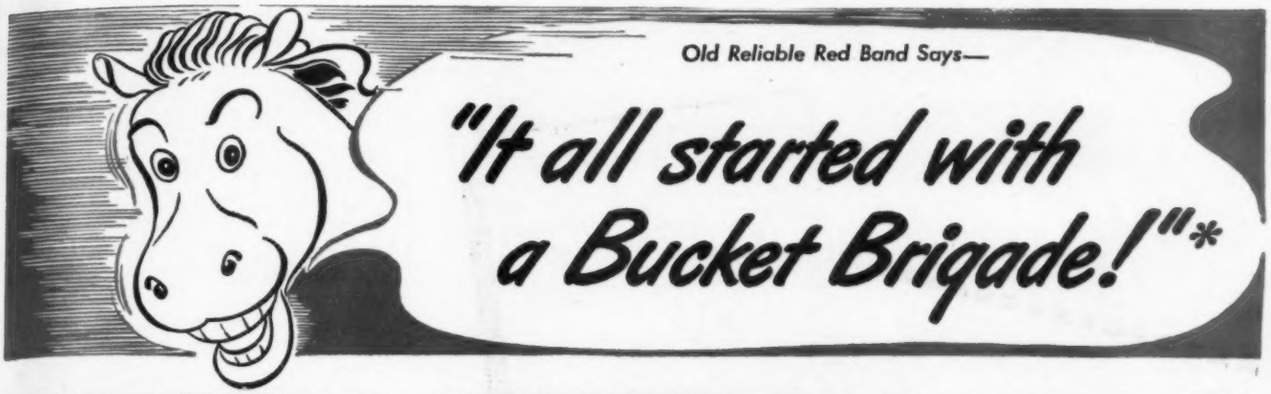
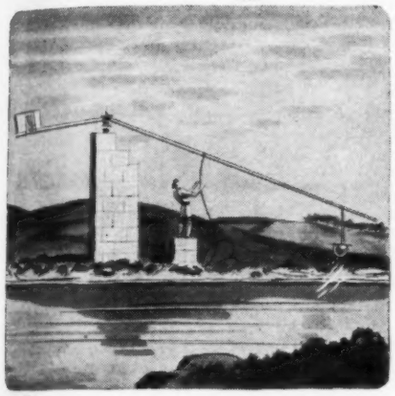
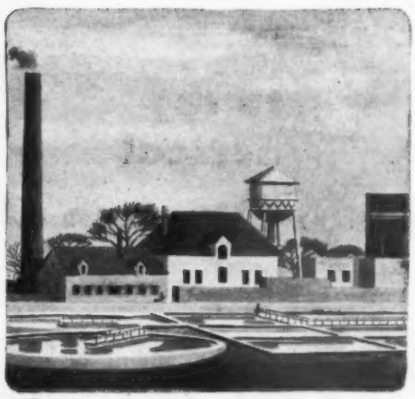




1 **Earliest recorded** mechanical waterworks system was known as the *"Shadoof."* Water was scooped for the Pharaohs' water supply out of the Nile. . . . Relays of slaves worked chains of buckets, day and night. . . . In 1485 B.C., the exiled brother of Rameses II took this method to Greece.

2 **As early as 300 B.C.,** miles of crude, hand-made aqueducts were carrying water from Alpine springs to Rome, where matrons filled household water jars at public fountains in the streets. . . . Early American colonists dug community wells—built cisterns to catch rain water.



3 **Today,** electrical horsepower from thousands of industrial type motors pump water for public requirements and industry—pump fluids for industrial processes. . . . Howell has specialized in building motors for pumps and other industrial needs for more than 30 years.

Have you a <u>hard</u> job for Horsepower?

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Howell Motors are quality-motors. They are smooth-operating because they are statically and dynamically balanced. They are better performing because they are built of the finest materials — copper or bronze rotors — and completely insulated. They are trouble-free on the job because they are designed for the toughest tasks in industry — consequently, they perform better on all jobs.

For your needs, in specialized or standard motors, phone the nearest Howell Representative. Remember, you pay no more for industrial type Howell Motors . . . but you always get top quality for your money.

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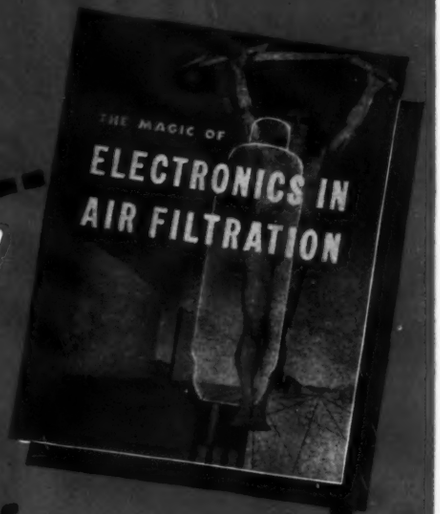
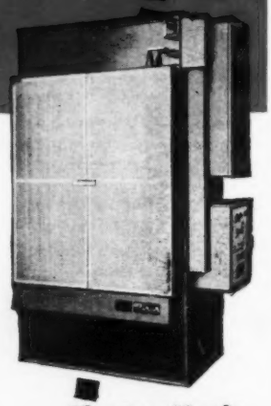
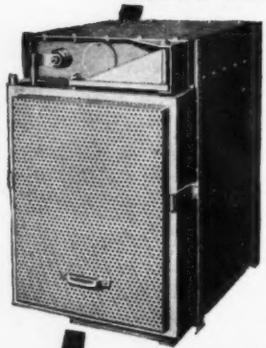


The control of dust, smoke, soot, bacteria, pollen, mold spores — in fact any airborne particles down to 1/100,000 of an inch in diameter— is made possible by AAF Electronic Precipitation.

Three completely different types of Electronic Filters are available to meet every industrial or commercial air cleaning problem. The interesting story behind the development of these filters, which are the result of 10 years of research, is told in the booklet shown here. Send for your copy today.



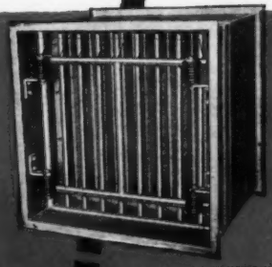
Electro-Matic



Electro-Cell

AMERICAN AIR FILTER CO., INC.
361 Central Ave., Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

AAF Electronic PRECIPITATORS



Electro-Airmat

the managerial group, we want to keep him there as long as his work is satisfactory. We want him to feel that he has made the team.

In selecting foremen, Harvester uses psychological tests to measure (1) interest, (2) mental ability or intelligence, (3) personal characteristics, (4) mechanical understanding, comprehension, insight.

Testing does not take the place of judgment in selecting a foreman. Its purpose is to provide a basis for improved judgment. Our procedure is to place before the man who is to select a foreman three inventories we have prepared about the candidate—his performance record, a description of his physical characteristics, and a chart showing his psychological characteristics, based on norms developed by testing 500 present foremen. Management then uses discretion in the amount of weight it gives to each of these three inventory checks.

Among the types of training offered are (1) the "progressive students' course" for men, usually graduates of technical schools, who are hired with the idea that they are management material; (2) a 6-month course of training in leadership offered to younger men who show evidence of management ability; (3) regular foremen's conferences for the discussion of current company policies, techniques, and day-to-day operating problems; (4) meetings with management men to discuss special topics, such as a new labor contract.

DISCUSS THE UNION CONTRACT

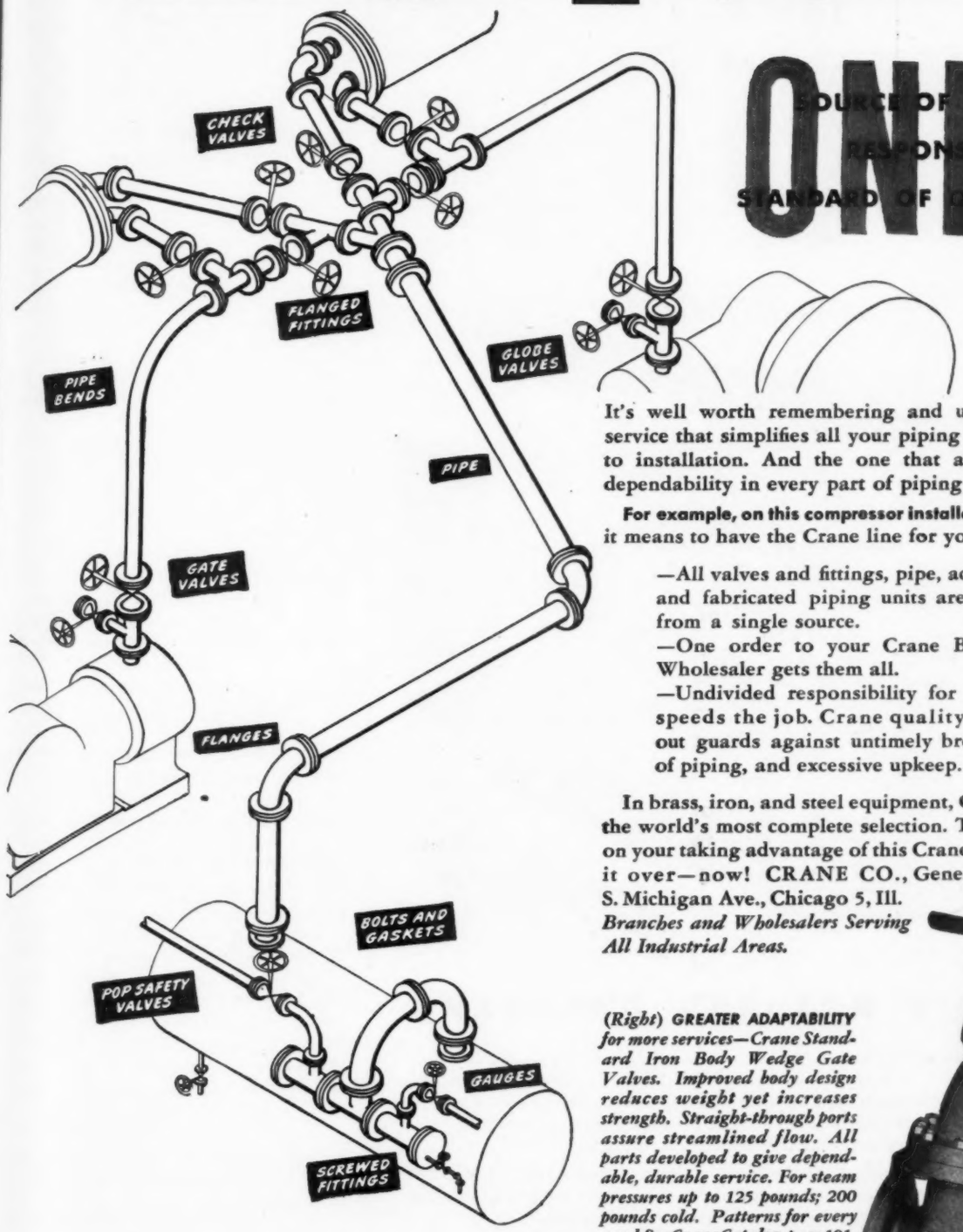
During the past winter, when many new contracts were negotiated (at the plant level, since Harvester has no company-wide contracts) the original union demands were discussed with the foremen, and they were encouraged to offer suggestions for counterproposals. Certain of the foremen or general foremen also sat in on the bargaining.

Then, after the new contracts were signed, all levels of management were given detailed knowledge, not only of the letter of the contract, but of the spirit which prompted the terms. The best opinion in our company holds that the foreman who really understands a contract, who has the ability to work with his men, and who has the guts to stand up and really represent the management of which he is a part, can nip in the bud about 95 percent of the trouble that arises. Small grievances can be promptly disposed of so that the foreman will have a smooth-running operation.

A new type of training the company has planned will take the foreman away

WORTH REMEMBERING!...

CRANE Supplies all Piping Materials



ONE
SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY

It's well worth remembering and using now—the service that simplifies all your piping jobs from plan to installation. And the one that assures uniform dependability in every part of piping systems.

For example, on this compressor installation, look what it means to have the Crane line for your partner:

—All valves and fittings, pipe, accessories, and fabricated piping units are specified from a single source.
—One order to your Crane Branch or Wholesaler gets them all.
—Undivided responsibility for materials speeds the job. Crane quality throughout guards against untimely breakdowns of piping, and excessive upkeep.

In brass, iron, and steel equipment, Crane gives you the world's most complete selection. There's no limit on your taking advantage of this Crane service. Think it over—now! CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas.

(Right) **GREATER ADAPTABILITY** *for more services—Crane Standard Iron Body Wedge Gate Valves. Improved body design reduces weight yet increases strength. Straight-through ports assure streamlined flow. All parts developed to give dependable, durable service. For steam pressures up to 125 pounds; 200 pounds cold. Patterns for every need. See Crane Catalog, page 101.*

EVERYTHING FROM . . .

VALVES • FITTINGS
PIPE • PLUMBING
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CRANE

FOR EVERY PIPING SYSTEM

KEEP
TRUCK
BATTERIES
UP
...with "STRATEGIC SPOTTING"

OF G-E BATTERY CHARGERS

Handling materials throughout the plant and warehouse is faster, more economical, if your electric trucks are kept up to par. By the "Strategic Spotting" of G-E copper-oxide rectifying units right in heavy traffic areas, there's less time out for battery charging. And local installations are always ready to give a battery a quick "noon-hour" boost to keep trucks rolling.

Completely automatic, G-E copper-oxide chargers are simple to use. Your driver sets the control and the charger takes over to finish the job, cutting out when charge is complete. There's no danger of overcharging.

G-E copper-oxide chargers for lead-acid batteries, for nickel-alkaline batteries, and for combination use are priced low, and are made in capacities to meet your battery needs.

For illustrated booklet and complete information, write Section A17-8-37, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Conn.

GENERAL ELECTRIC

from his job for two weeks of intensive training in human relations at a central school in Chicago, where he will mingle with men from other departments and gain a better-rounded view of business as a whole.

PROFIT-SHARING PLANS ARE NOT A CURE-ALL

Results of a survey made by the National Industrial Conference Board show that out of a total of 161 true profit-sharing plans, 60 percent were abandoned. More than a quarter of the discontinuances were the result of employer or employee dissatisfaction, whereas 36 percent were dropped because there were no profits to share or the company had gone out of business or changed hands.

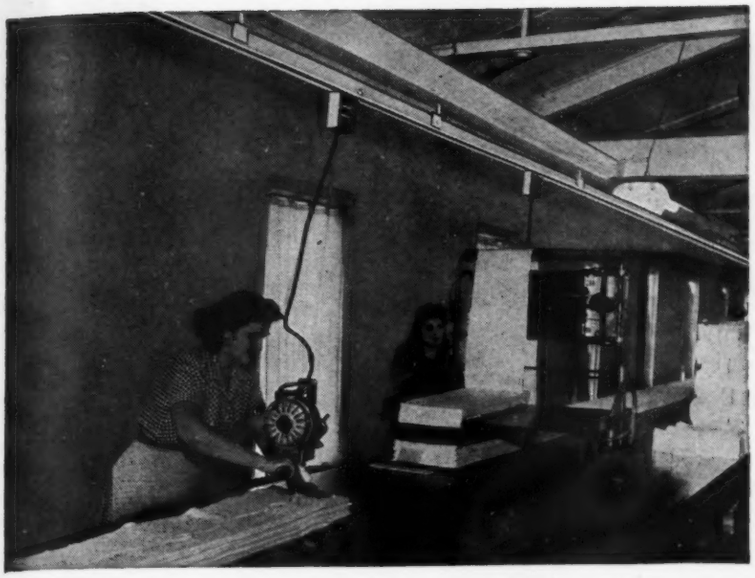
Reasons for employer and employee dissatisfaction with profit sharing, as shown by the analysis, arose mostly from the employees' lack of understanding of the principles involved and their inability to comprehend the influence of the business cycle on profits. Profit sharing apparently succeeds fairly well when the company prospers, but dissatisfaction arises when profits diminish or disappear.

Profit sharing, although not a new idea, developed rapidly through the war years. Because of the tax advantages possible under an approved trustee plan, an employer in the excess-profits tax brackets could give employees a share in profits without much loss in income. Another advantage of trustee plans is that the contribution is not considered taxable income to the employee until it is made available to him.

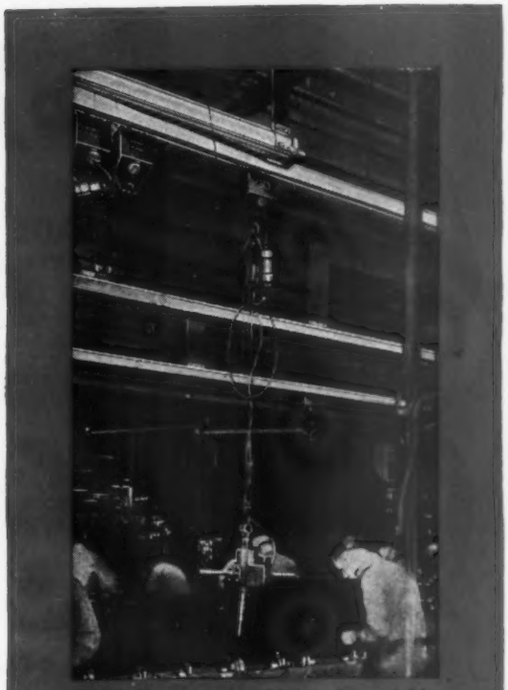
Such plans may also act to stabilize the wage scale by providing a flexible supplementary payment which fluctuates with business conditions and yet permits the company to control the wage cost so that it bears a definite relation to company income instead of saddling the enterprise with a permanent charge of increased wage rates.

Experience shows that profit sharing cannot be used as a substitute for a sound industrial relations program. It should be but one factor in a well-rounded program of employee security benefits such as insurance and pension benefits, and not a substitute for them.

Some of the most successful plans provide for accumulation of the money in a fund that is not available to the employee until retirement or in the event of an emergency. These deferred-distribution plans, as they are termed, have been of considerable value in aiding employees to accumulate large



FEEDRAIL used for cutting machine and moving cloth laying machine with inspection light.



FEEDRAIL supporting high-cycle portable tool and balancer in machine shop

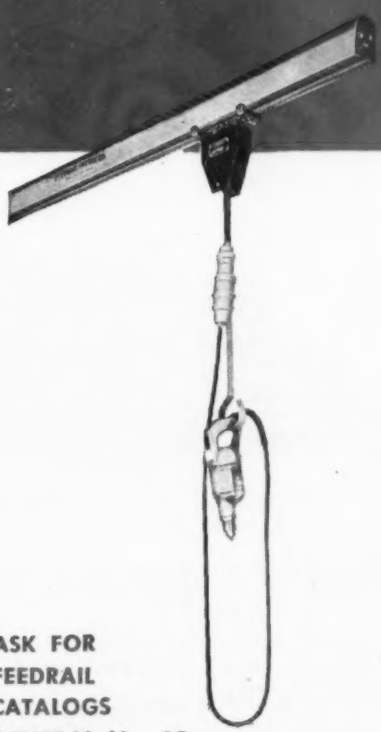
KEEP TOOLS AND CABLES OFF THE FLOOR *with* ELECTRIC FEEDRAIL

FEEDRAIL is an enclosed electric busway system that supports and feeds portable tools. Heavy duty FEEDRAIL trolleys may be equipped with counterbalances to help support the tools. A dead-front fuse block on each trolley or EVER-LOK connectors provides individual protection for high cycle or universal tools.

All electrical contacts are enclosed, and protected from mechanical injury and dust and the system is grounded. Each section carries the Underwriters' Label.

Keeps cables and tools off the floor — no accidental disconnection — no delay — and safety everywhere.

FEEDRAIL is ideal for modernization of any plant that requires production changes from time to time. Also for moving test lines, monorails, cranes and hoists.



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To Your REQUIREMENTS
If you require coated fabrics for specific applications, Hodgman will engineer them for you.
Such valuable properties as great flexibility, light weight, unusual toughness, resistance to stains, abrasion, extremes of temperature, and protection against moisture, deterioration and many chemical agents can be built to order in Horco Fabrics.
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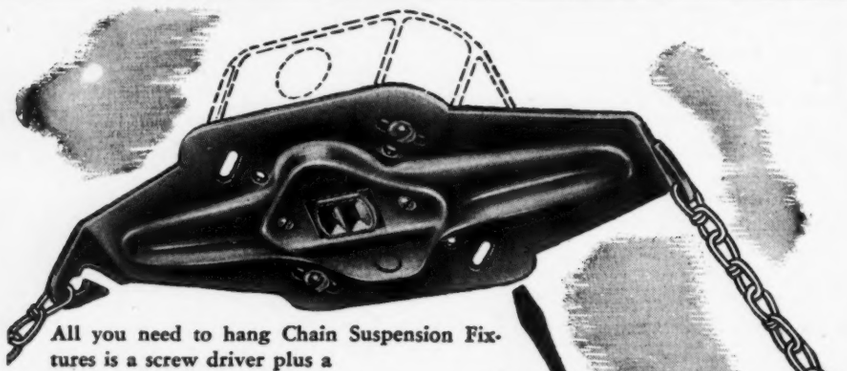
Fabrics



All you need to hang Chain Suspension Fixtures is a screw driver plus a

HYDEE HANGER*

Just connect wires, screw to outlet box and the job's done—in a few minutes!

Self-grounding—2-wire cord and plug may be used. Fits standard 4" or 3¼" outlet box or plaster ring. Complete with receptacle, two 5-foot chains, "S" hooks and cord clips. Nothing else to buy. $1.50 Each List

Day-Brite Lighting, Inc., 5441 Bulwer Ave., St. Louis 7, Mo. Nationally distributed through leading electrical supply houses.

*Patent No. D-141024. Others pending. Underwriters approved.

904

IT'S EASY TO SEE WHEN IT'S
DAY-BRITE Lighting

sums of money. The plans of Procter & Gamble Company, of Sears, Roebuck & Company, and of the Jewel Tea Company, are of this type. It is a plan, however, that probably will not meet the current demands of labor.

The analysis shows that the plans were more effective in improving efficiency and reducing waste in smaller establishments.

Success of profit-sharing plans depends, according to the study, on the presence of certain basic conditions. One such condition is that the wage scale equals or exceeds the going rate of the community for similar tasks. It must be impressed upon the worker that the supplemental bonus depends upon profits and is not a part of wages.

HERE'S STUFF REDS FEED TO WORKERS

The kind of anti-industry propaganda currently being put out by American Communists is shown in these quotations from a Communist Party pamphlet distributed to Indianapolis packing-house workers.

"You scored a great win in your recent strike. You showed the workers of the country how it could be done.

"But you know, and we know, that this victory wasn't a first round knockout nor was it a final round decision. The fight has been going on for generations and is not yet finished.

"It's an old story. As old as the profit system.

"Your union scored a wage increase . . . It wasn't a matter of luck. Your bosses don't give raises. You have to wring them out of their hides.

"The rulers of the Packing Empire are out to smash the union, to smash OPA, and jack up their prices to fill their pockets twice as much as before. They're trying to rob you of the wage increase you won.

"And the Truman Administration isn't exactly unfriendly to their ideas, either.

"Call it what you like—Capitalism, Profit System, Free Enterprise—it's the worker who usually gets the dirty end of the stick.

"Prosperity is the exception and not the rule . . . It does guarantee War and Depression.

"And all the time, the big trusts get bigger and their high profits go higher. That's how it works on the other end . . . Somehow the benefits of this system, and the laws, always seem to be on the side of the trusts. This may seem confusing, but it's certainly not amusing.

"Socialism would completely eliminate profits and guarantee you and your

ECONOMY THRU EFFICIENCY!!

SLIGHT PUSH — IT'S CONNECTED

CONNECTED

EASY PUSH ON SLEEVE — IT'S DISCONNECTED

HANSEN COUPLINGS SAVE

TIME • MATERIAL • MONEY

You see more Hansen couplings in daily operation in plants all over the country, because when the pressure was on for peak production during the war Hansen couplings outperformed all others and were a contributing factor in not only peak production but economical and efficient production.

Today, economical and efficient production head the list of "musts" in any industry. Make no mistake about this... no coupling on the market has the all 'round advantages of Hansen couplings.

Hansen Push-Tite couplings are simple and easy to operate, slight push of plug into socket it is connected and air is automatically turned on, easy pull on sleeve with thumb it is disconnected and air is automatically shut off. No twisting or turning to lock, connect or disconnect, no kinking of hose due to swivel action.

Hansen Push-Tite couplings will handle pressures from ounces to well over 10,000 pounds without leaking.

There's a Hansen coupling for air, oil, grease, oxygen, gasoline and acetylene and they come in a wide range of sizes.

Every day new uses are found for Hansen couplings, perhaps you have a problem that can be licked by the adaptation of one of our couplings, their versatility and uses are unlimited. • *Send in for free industrial catalog.*

THE HANSEN MFG. CO.

1786 EAST 27th STREET • CLEVELAND 14, OHIO

Bond General Purpose Truck

For warehouse, shipping room, loading platform—anywhere in the plant. Wheels, set inside frame, turn freely—won't catch on bags or other obstacles. Round, cold rolled steel axle easily replaced. Parallel sides add efficiency to handling of cases and barrels.

Materials flow smoothly, safely, efficiently on these Bond handtrucks. Each of this husky trio rolls easily...withstands hard usage. Bond's long experience as specialists in materials handling equipment is your guarantee of dependability.

Write today for additional information on these trucks.

BOND FOUNDRY & MACHINE CO., MANHEIM, PA.

Bond Keg and Case Trucks

Two sturdy, well-constructed trucks at an unusually low price. Both made of 1-inch square high-carbon steel tubing. Can be equipped with plain or roller bearing semi-steel or rubber tread wheels.

No. 4691—The Truck with a Thousand Uses

No. 4692—With Steel Guards for Handling Bags

families a full pay return for your labor. It would mean the farmer receiving top pay . . . the price of meat hitting a new low. It would mean no more unemployment . . . ever rising standards of the people. It would mean a government that would protect your interests because then it would be acting in the interests of the masses of people.

"Atomic power would be used for running factories, trains, boats . . . not to destroy humanity.

"Do you know that in the Soviet Union . . . the working day was reduced to 8 hours right after the ending of the war, with no reduction in take-home pay of the wartime 10-hour day . . . Unemployment does not exist there because the profit system does not exist there. The trade unions are very powerful, having 27,000,000 members.

"Socialism is the goal of the Communist Party.

"Members of our party have been very closely identified with the history of your union. Together with you, they helped to found it and, side by side with you, have fought for it ever since . . . The fight of our party has been inseparable from the fight of your union and of all unions. . . .

"You will find in the program of our party the connection you're looking for, between your fight for higher wages, equality and peace, and the final solution to all our struggles which will be found in socialism.

"We want you and many more packing-house workers in our ranks . . . our party will fight to the finish for the everyday needs of our people, and for socialism. Join the Communist Party."

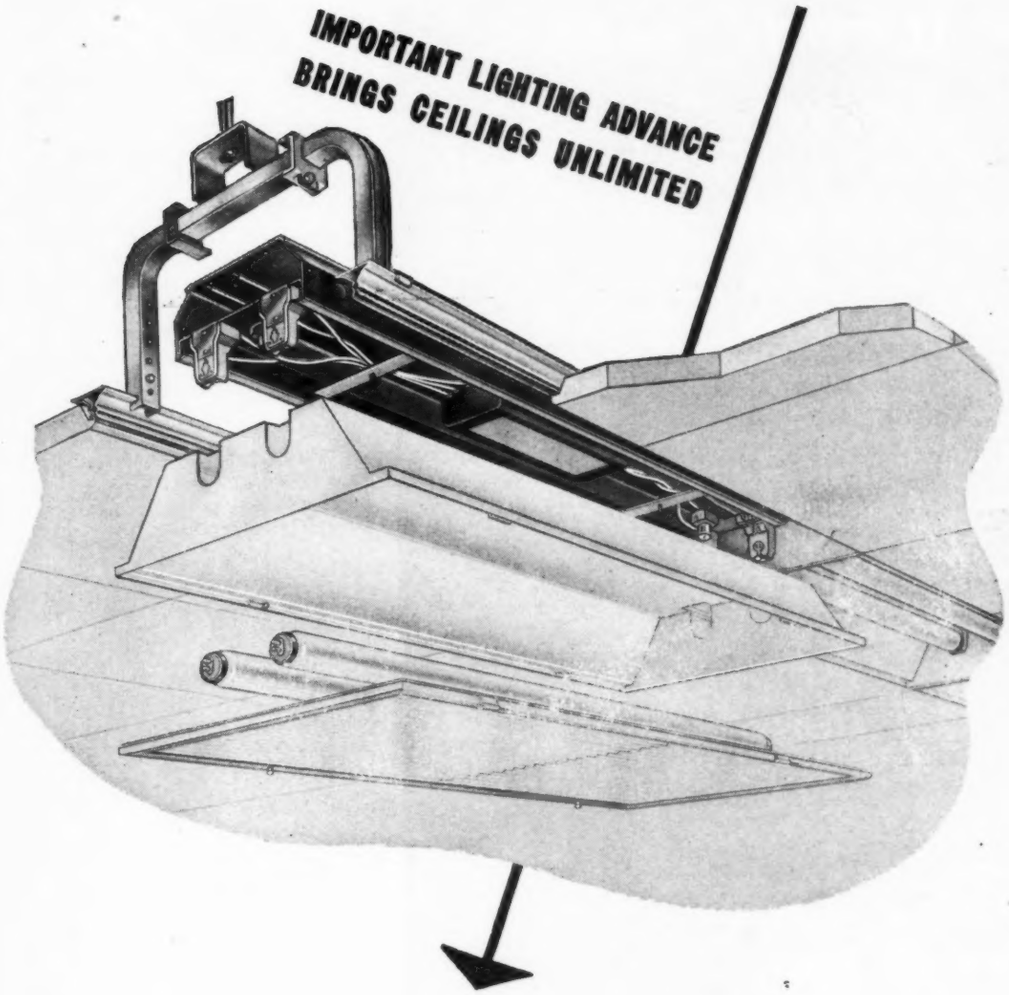
Behind the Byline

Facts About *Factory's* Authors

The article describing the big materials handling job (page 88) at United States Rubber Company's Scottsville plant is contributed by a young Virginian, Elmer L. Johnson, Jr., who obtained his first experience in this field at the Newport News Shipbuilding & Dry Dock Company. At the University of Virginia, which he attended from 1936 to 1940, he was a member of Zeta Psi Fraternity and Skull and Keys Society. His hobbies are sports and reading.

CONTINUED ON PAGE 278

IMPORTANT LIGHTING ADVANCE BRINGS CEILINGS UNLIMITED



THE MILLER FLUORESCENT TROFFER LIGHTING SYSTEM, an important engineering achievement, makes it possible for stores, offices, schools, factories and public buildings to be planned around the lighting. Fixtures merely provide light but this complete lighting system provides light at the overall level desired, and in addition, it can be installed as single units, blocks, geometric patterns or light strips to form any ceiling pattern desired . . . CEILINGS UNLIMITED. Consider these economies — (1) the MILLER CEILING FURRING HANGER (patented) reduces number of supports needed from structural ceiling and simplifies installation; and (2) completely wired continuous channels (MILLER pioneered) reduce wiring costs, conduit and conduit fitting costs from 50% to 80%.

MILLER field engineers are conveniently located to serve you.

THE MILLER COMPANY

ILLUMINATING DIVISION, MERIDEN, CONNECTICUT

ILLUMINATING DIVISION — Fluorescent, Incandescent Mercury Lighting Equipment

HEATING PRODUCTS DIVISION — Domestic Oil Burners and Liquid Fuel Devices

ROLLING MILL DIVISION — Phosphor Bronze and Brass in sheets, strips and rolls

FOUNDRY DIVISION — Non-Ferrous Metal Castings

"Take it away" with

CM HERC-ALLOY

SLING CHAIN

Every Inswell electric-welded link in this CM Herc-Alloy steel chain personifies safety and lifting strength. From the white hot ingots in the nation's steel mills to the finished structural girders for our skyscrapers, CM Herc-Alloy Sling Chains have been doing a handling job that ranks them "tops" in industry... "tops" in dollar value, service life, maximum safety or any other yardstick of measuring.

Ask your mill supply distributor about the particular CM Herc-Alloy Sling Chain for your job and learn first hand the reasons why the top names in American industry have been using them for years.

COLUMBUS-McKINNON

CHAIN CORPORATION

(Affiliated with Chisholm-Moore Hoist Corporation)

GENERAL OFFICES AND FACTORIES: 130 Fremont Ave., TONAWANDA, N. Y.

SALES OFFICES: New York, Chicago and Cleveland

Fifteen of Herbert N. Johnston's 35 years have been spent with the Philco Corporation (page 94). He graduated from Drexel Institute and in his junior year won the George W. Drexel scholarship prize. He has also studied industrial electrification at the University of Pennsylvania and similar courses at other schools. Johnston's hobby is music. Well-known as amateur cornetist, conductor, composer for many years, he now conducts Philco's 65-piece band—which has achieved national recognition among industrial bands—and spends all leisure time on this activity.

Business travel has taken J. E. Burns (page 100) to England, France, Russia, China, Japan, India, South America, and Australia. He is also a veteran of both world wars. A graduate of the University of Michigan, he has been associated with Budd Wheel Company, Wright Aeronautical Corporation, and is now plant engineer at E. R. Squibb & Sons. His chief hobby, next to his family, is building surf fishing rods and reels, with which he hopes to catch a striped bass that will top the world's 73-lb. record.

From Gassville, Arkansas, "the heart of the beautiful Ozarks," Keith L. Morey (page 102) moved to Chicago. He studied electrical engineering at Washburn Continuation School, fire prevention at the University of Illinois, and police work at Chicago Heights police department. He has been active in the electrical trade for eight years and for five years was a member of the Chicago Heights police department. Shortly before the war Buda called him to organize and train a plant police force. He took charge of safety in a company that grew from 600 employees to more than 4000 in 18 months. He has served as secretary of the Suburban Engineering Division of the Greater Chicago

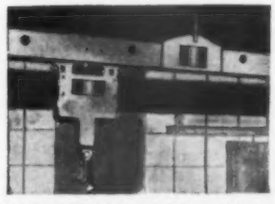
Lights added or shifted without rewiring

A stepladder is the only equipment necessary to add new lighting fixtures with a BullDog Universal Trol-E-Duct system. Simply insert the weight-supporting clamps in the duct casing and tighten the lock nuts with your fingers. Then insert the twist-out plug in the duct casing and give it a quarter turn.

SECTIONS JOINED WITHOUT TOOLS. *Installation time cut to a minimum . . . special couplings snap into locked position automatically, hold sections together securely.*

COMPLETELY ENCLOSED FOR SAFETY. *Twistout plugs and trolleys collect current from copper bus bars safely enclosed in Universal Trol-E-Duct.*

BUSTRIBUTION DUCT FOR PLUG-IN POWER DIRECT TO MACHINE. *Machines moved without down-time for the rest of the line. A variety of circuit protective tap-off Bus Plugs for spotting and plugging in machines instantly, without rewiring.*



INDUSTRIAL TROL-E-DUCT MOVES THE POWER WITH THE TOOL OR LOAD. *Production rates go up — operating costs go down with this flexible system. Moving trolleys transmit power safely from duct bus bars to moving cranes, hoists and portable tools.*

You Can Do It With BullDog Universal Trol-E-Duct

You can have the *right light* in the *right place*—at any time and with little effort or expense. Miracle? Well, maybe just a small one. We call it Universal Trol-E-Duct.

In a plant equipped with Universal Trol-E-Duct, you can have light at the precise point where it's needed, because every inch of this continuous slotted duct is a potential electrical outlet.

You can add new lights of any type or you can move old ones. You can put small portable tools to work without long extension cords. And you can do both jobs without costly delays for rewiring.

Universal Trol-E-Duct is easily installed with prefabricated, standardized sections. Runs of duct can be altered, or completely dismantled and re-installed with complete re-use of all material.

For better production through better lighting, call a BullDog field engineer, or write for detailed descriptive folders.

BullDog also Manufactures Vacu-Break Safety Switches—SafToFuse Panelboards—Switchboards—Circuit Master Breakers—BUStribution DUCT for "plug-in" power—Industrial Trol-E-Duct for "moving" electrical loads.

BULLDOG

ELECTRICAL DISTRIBUTION SYSTEMS

BULLDOG ELECTRIC PRODUCTS COMPANY, BOX 177, R. PK. ANNEX, DETROIT 32, MICHIGAN
In Canada: BullDog Electric Products, Ltd., Toronto. Field Engineering Offices in All Principal Cities

AJAX

FLEXIBLE COUPLINGS

Safeguard your direct-connected machines against unavoidable misalignment with the positive, resilient drive of Ajax Flexible Couplings.

Write for Data Book.

AJAX FLEXIBLE COUPLING CO. INC.
WESTFIELD, N. Y.

Safety Council and is now chairman. He enjoys golf, fishing, swimming, and is somewhat of a camera fan.

Henry Ness (page 110) was born and went to school in Norway. He came to the United States at the age of 20 and continued his education at Johns Hopkins University. The past 9 of his 25 years of industrial experience have been spent with Triangle Conduit & Cable Company. He is a member of the New Jersey Society of Professional Engineers, and he spends his leisure hours hunting and fishing.

Readers of B. M. Schowe's article (page 123) will better appreciate the keen understanding he imparts to his report on the employment of the deaf, in knowing that he learned all the frustrations of deafness through the gradual loss of his hearing before he was 20 years old. Graduated from Gallaudet College, he has been with Firestone for 27 years. His special assignment there has been the placing and counseling of deaf workers. For the past 12 years he has also pioneered in the field of labor economics. His articles on vocational training and the art of being deaf have appeared frequently in professional magazines for educators of the deaf. A grandfather, over 50 in age and under 85 in golf (most of the time), he admits with the patient good humor that enlivens his article: "Main thing I have learned is that deafness is not fatal."

George Smith (page 135) is now studying, at the University of Pennsylvania, industrial relations involving traffic and personnel problems. He is a graduate of the Drexel Institute of Technology. A manufacturing supervisor for 9½ years, he had a broad background of production control experience before he became interested in shipping procedures. A Blue Lodge Mason and carrying memberships in several technical societies, he still finds time for his favorite hobby—photography.

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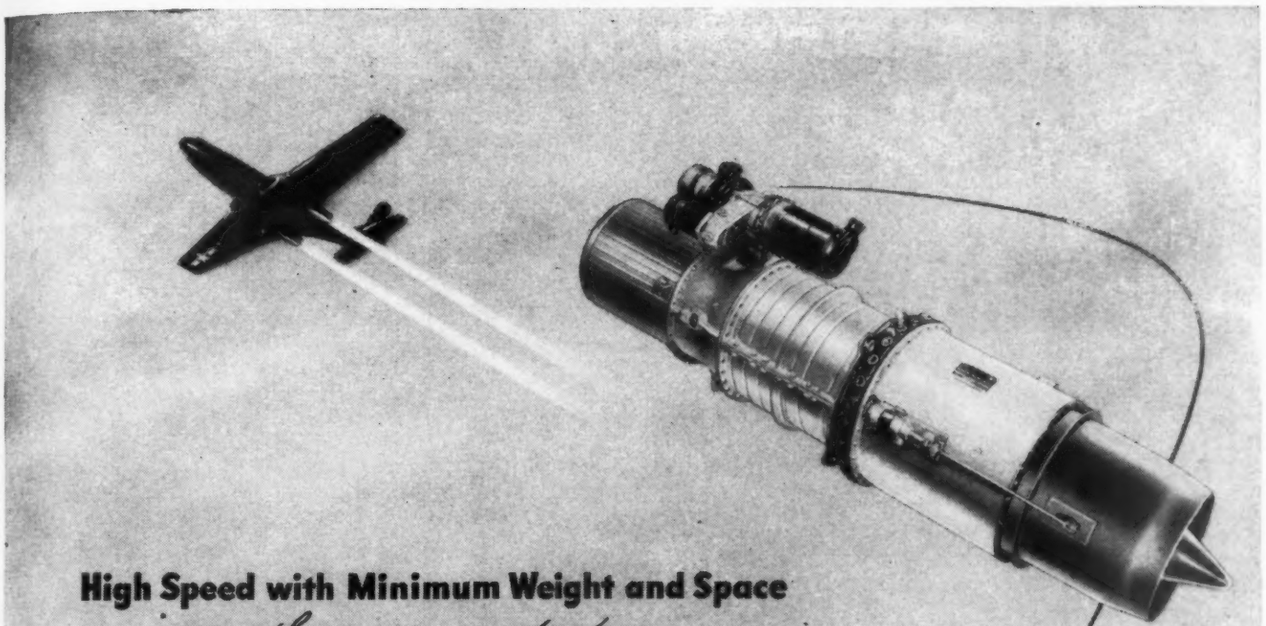

High Speed with Minimum Weight and Space

these are secrets of

JET PROPULSION

Westinghouse Turbo-Jet Engine

As swift as sound—the new miracle planes owe their tremendous speed to the jet propulsion engines that power them.

High speed—light weight—extreme compactness—these are three basic requirements of today's jet propulsion engine design.

Working closely with manufacturers of these new engines, Foote Bros. have produced accessory drives which are geared to the shaft of the turbine and which provide the power necessary to operate pumps, starter motors, generators and other equipment.

This specialized application suggests one use of Foote Bros. Power Units. On any type of machine or equipment they permit exact timing of operations from remote control. Position may be predetermined and held to close limits. These Power Units may be used to actuate linear or rotary motion.

Your engineer may find an idea for improving your product in the Power Unit Bulletin recently issued. Foote Bros. engineers will gladly work with them on the design of a unit to meet your specific need.

★ ★ ★

FOOTE BROS. GEAR AND MACHINE CORPORATION
Dept. I, 4545 South Western Boulevard • Chicago 9, Ill.

A recently issued bulletin on Power Units giving complete engineering data on "packages of power" will be sent on request. Also available is a bulletin on Aircraft Quality Gears.

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Better Power Transmission Through Better Gears

Foote Bros. Gear and Machine Corporation
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Please send me Bulletins on: ☐ Power Units
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President of the Tool Owners Union and president of Eddy-Rucker - Nichols Company, management consultants, Allen W. Rucker (page 138) is a Virginian transplanted to New England 20 years ago. He is known for his long service as a consultant, for his interest in civic affairs, and as the author of "Labor's Road to Plenty" and "Scientific Price Management." He has appeared frequently on radio programs of the Boston Industrial Relations Council and "Wake Up, America" debates. Tool Owners Union, of which he is one of the founders, apparently has hit a chord which elicits deep response from many Americans—from farmers, veterans, and small businessmen to the presidents and treasurers of great corporations.

R. H. Wilson (page 142) is the author of numerous articles on stockroom purchasing and stock control including "A Scientific Routine for Stock Control," published in *Harvard Business Review.* Wilson received his B. Sc. degree from Victoria University, Manchester, England, in 1913, and the M. Sc. in 1923 from the same institution. He joined Western Electric Company in 1914, and in 1919 was made research staff engineer. In that capacity he introduced new methods of stock control which reduced costs and increased the efficiency of operations. Since 1939, he has been general service manager of Bell Telephone Laboratories, Inc.

Thirty years with the Lionel Corporation is the record of Charles V. Giaimo (page 146). Starting at the age of 14, Giaimo has been production worker, designer, trouble-shooter, and assistant superintendent. This year he became works manager. Two older brothers and a sister also work at Lionel. All were born in Palermo, Italy. All pride themselves today on their American

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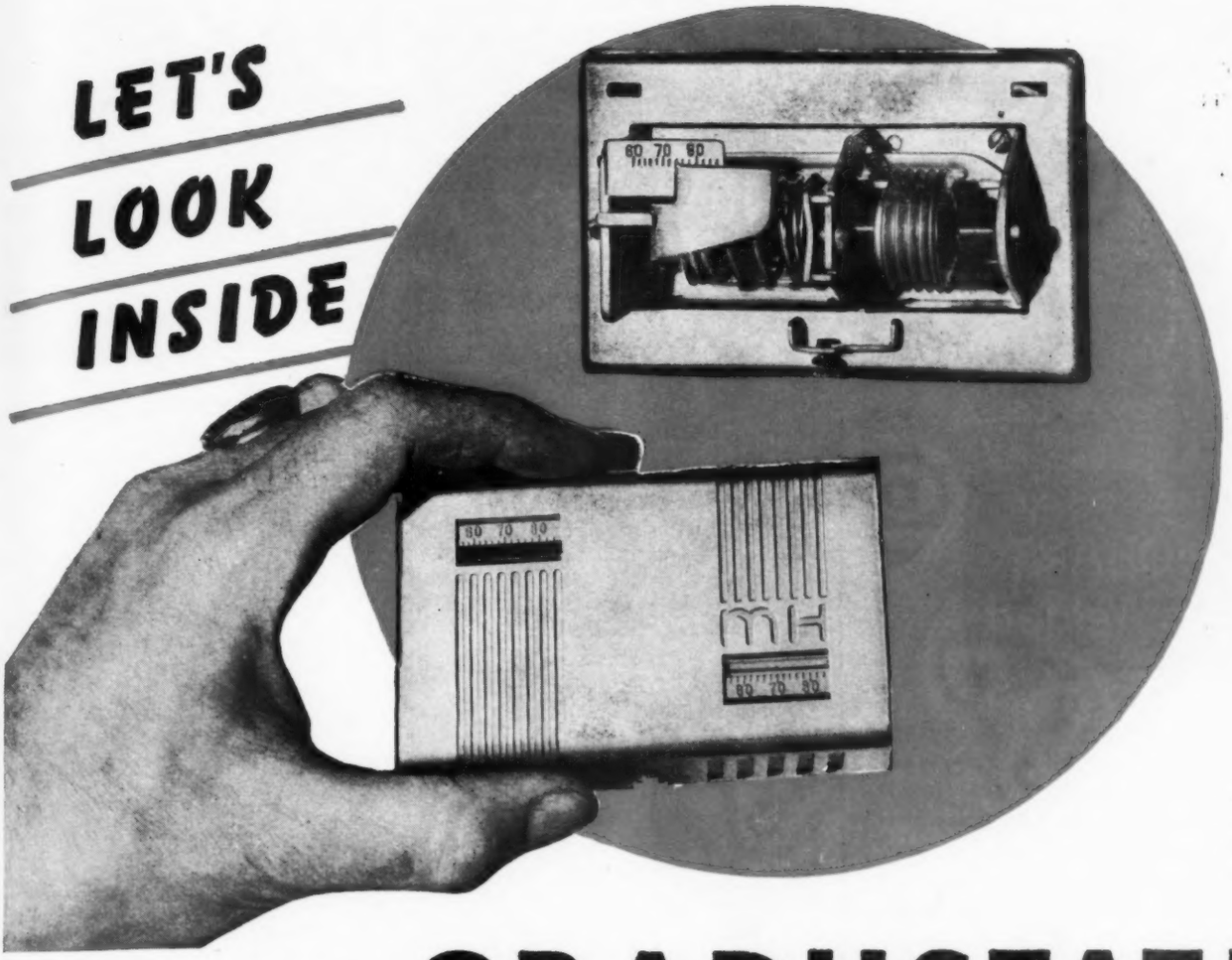

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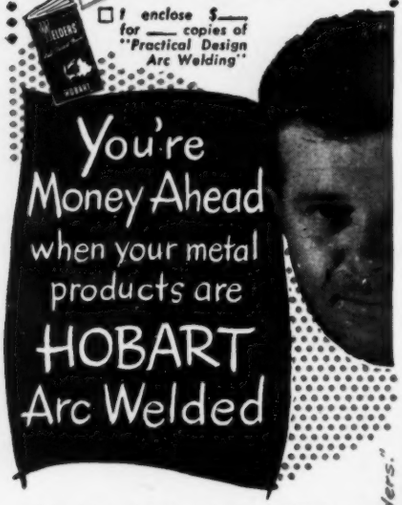

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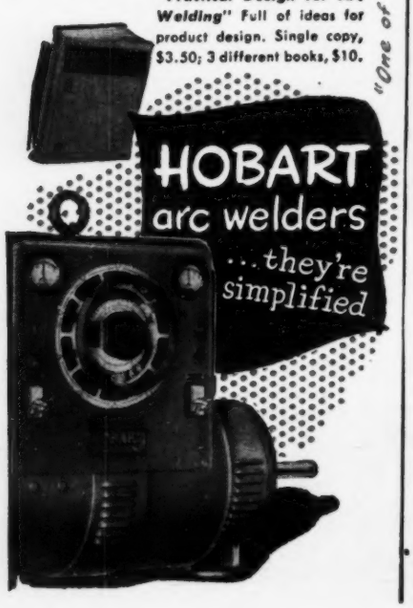

BEHIND THE BYLINE *(continued)*

citizenship. His principal hobby is not far divorced from his business. It is toy trains. He also enjoys the life of a gentleman farmer on his two-acre "homestead" at Madison, N. J. He likes the water, too—deep-sea fishing in the summer; figure skating in the winter.

J. R. Clemens, co-author (page 150), has been with Link-Belt Company 12 years, including 4 years in shop maintenance departments, 1 year in time study, 2 years as supervisor of the procurement department, and 3 years as assistant to the plant engineer. During the war he taught ESMWT course at night at De Paul University. Spare-time interests include photography and fishing.

Manufacturing research and metal fabrication are the top interests of **R. G. Hawley,** co-author (page 150). His apprenticeship was served as boilermaker and structural iron worker, and he studied machine design, business management, and production control. He has specialized in welded fabrication of pressure vessels, alloy equipment for the dairy industry and laboratories, and fabrication of special machine tools.

Nearly all of Richard G. Greiner's (page 154) 26 years with Allis-Chalmers Manufacturing Company have been spent in the field of industrial training. During these years, he has supervised the training of thousands of shop and drafting apprentices, graduate students, shop and office supervisors, and general company employees. At the present time he is manager of the training department. He is president of the Wisconsin Industrial Training Directors Association and a member of the American Society of Training Directors. A great outdoor sports enthusiast, his best-loved activities are fishing, and deer-hunting with bow and arrow.

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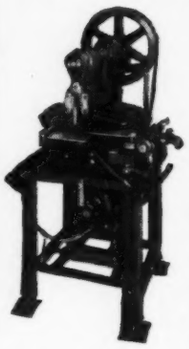

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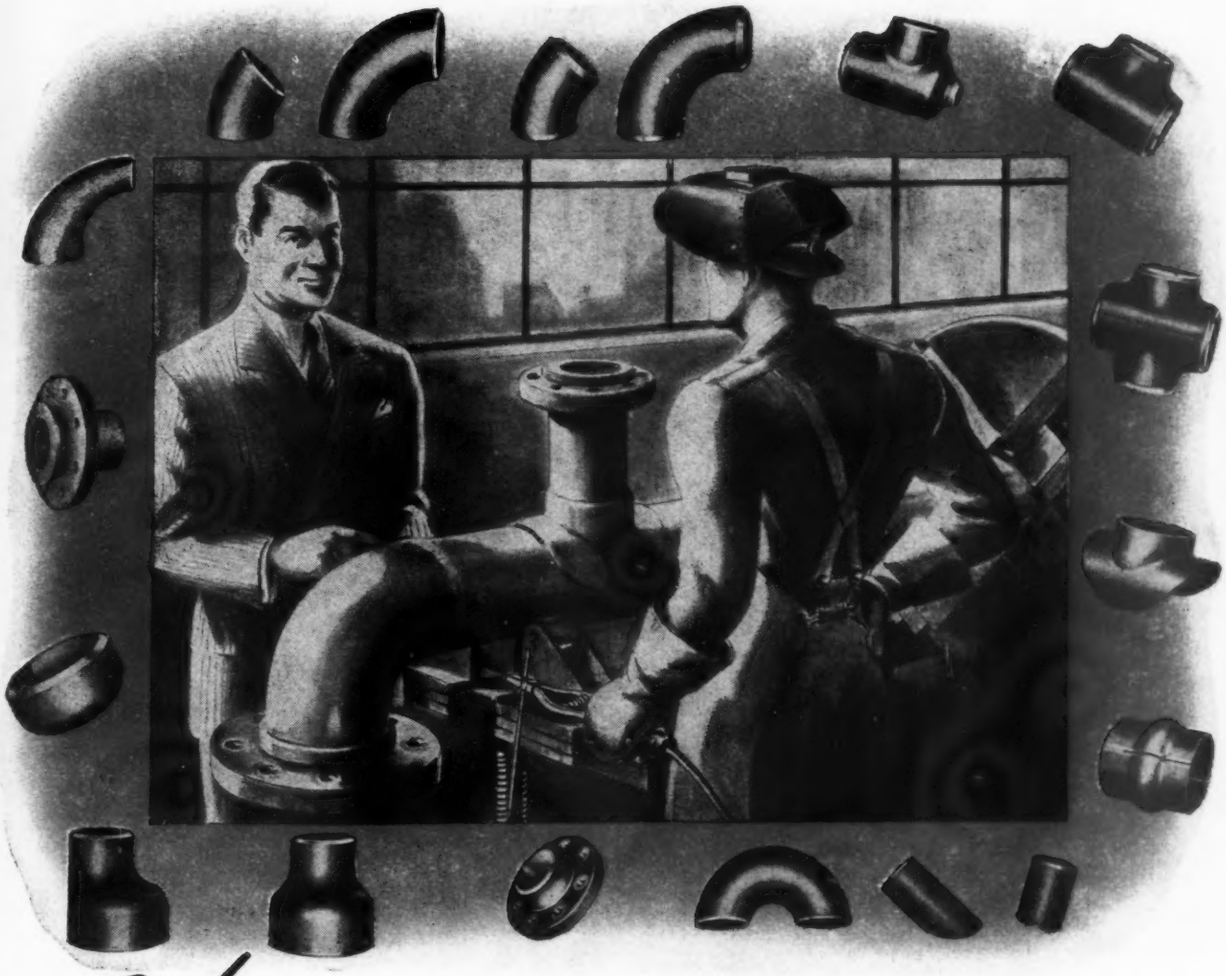

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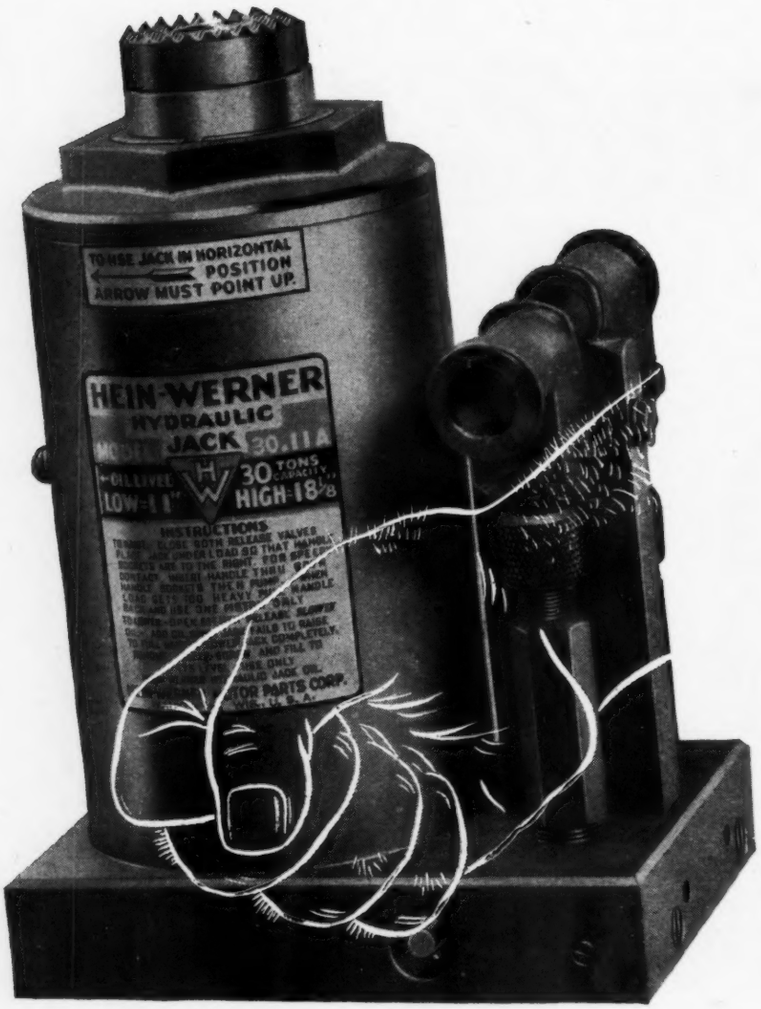

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MACHINE UTILIZATION AND ECONOMICAL ASSIGNMENT

JOHN W. FIELD

How many unit drive machines can an operator economically tend? This is a question which is becoming more important to management, since unit drive machines are increasing in number.

There are many ways to determine economic machine assignment, which range from intuitive guessing to complex formulation. One of the commonest methods is to determine by time study the total cycle time and the downtime of an operation. Dividing cycle time by downtime* a value approximating the economic machine assignment may be attained. This method however does not take into account such factors as interference, machine, and operator costs, so that it often gives highly inaccurate results.

COMPUTING INTERFERENCE

Before an economic machine assignment may be determined it is necessary to compute the value of machine interference. For those who are not familiar with machine interference, it may be explained briefly as follows: When two or more machines, not perfectly synchronized to one another, are operated by one operator, there are periods when one or more must be shut down while the operator attends another machine. This delay is interference.

Failure to take interference into account has resulted in time standards which have been "tight" as much as 20 percent. With a touchy union at the elbow of management, this may mean a strike.

There are two ways to determine the interference of a machine battery—actual study and formula. Actual study is often tedious and delaying.

When a battery of machines is perfectly synchronized, the number that an operator can tend without interference may be determined by the following formula which is popular among industrial engineers. Let us call this number *Critical N* or *CN*.

(1) $CN = 100/D$

Where D = Percentage of downtime to cycle time

CN = Number of machines in battery

The logic of this formula is simple.

* For cycles including internal work time as well as downtime, total work time—the sum of downtime and internal work time—should be substituted for downtime. This substitution should be made in all formulas appearing in this article for work cycles where internal work time is an important factor.

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If downtime, for example, is 20 percent CN will be 5; a man will be able to operate 5 perfectly synchronized machines without interference. As soon as he finishes setting up the first machine he turns to the second, sets it up and turns to third, and so on. By the time he finishes the fifth machine, the first will just reach the end of its run.

Add an additional machine to this perfectly synchronized group of machines and there will always be two machines down at once. This kind of interference we shall call "overload interference."

For machine loadings equal to or less than CN, there is no overload interference. If the machines are not perfectly synchronized, however, there is interference, as we showed above, owing to the chance that two machines will stop together. This interference we shall call "synchronous interference."

In 1942 industrial engineers of the General Cable Corporation under the writer's direction set up the following formulas for determining machine utilization.

(2) For machine batteries smaller than CN as determined by formula (1) —synchronous interference range

$$U = \frac{MT}{.0001 - (N-1)\,D^2K + 1}$$

where U = Utilization factor in percent
MT = Percentage of machine time per cycle
D = Percentage of downtime per cycle
N = Number of machines in battery
K = Degree of synchronization

(3) For machine batteries greater than CN as determined by formula (1) —overload interference range

$$U = 100\ MT\ N \times D$$

Formula (2) is an empirical formula derived from actual study data, and checks very closely with the results of actual studies.

TIME STUDY PROVIDES DATA

All information necessary to solve U can be obtained by simple time study. Estimating the value of K is the only operation calling for keen judgment. In estimating K, the time study man should keep in mind that for perfect synchronization between machines, $K=0$; for conditions approaching randomness $K=1$. Generally the proper value of K ranges between 0.2 and 0.3 as most batteries of machines are neither perfectly synchronized, nor do they run according to the statisticians'

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definition of "at random." Where machine runs are fairly constant and the machines in a battery are numerous the K value chosen should be low. Where machine runs are very irregular and the battery is large, a value near to 1.0 should be chosen. If in doubt, a value of 0.5 will give fairly accurate results.

Formula (3) is based on the fact that for perfect synchronization at CN there will be no interference. U will equal MT. Add additional machines to the battery and the utilization of each machine will be reduced proportionately to each addition. Thus:

$$U = \frac{CN}{N} \times MT$$

Substituting the value of CN in formula (1), we get formula (3).

Since synchronization interference is negligible compared to overload interference for overload conditions, synchronous interference was not included in formula (3).

COMPILING TABLES

Using these two formulas, tables of utilization may be compiled, one for $K=1$ and one for $K=0$.

TABLE I—VALUES OF NET MACHINE UTILIZATION $K = 1.0$

Number of machines per man (N)	*Percentage of downtime per cycle (t)*				
	10	*20*	*30*	*40*	*50*
1	90.0	80.0	70.0	60.0	50.0
2	89.0	77.0	64.0	*52.0*	*40.0*
3	88.0	74.0	*59.0*	50.0	33.5
4	87.0	71.0	58.0	37.5	25.0
5	86.5	*69.0*	47.0	30.0	20.0
6	86.0	66.5	39.0	25.0	16.5
7	85.0	57.0	33.5	21.5	14.0
8	84.0	50.0	29.0	19.0	12.5
9	83.0	44.5	26.0	16.5	11.0
10	*82.5*	40.0	23.5	15.0	10.0

TABLE II—VALUES OF NET MACHINE UTILIZATION $K = 0$

Number of machines per man (N)	*Percentage of downtime per cycle*				
	10	*20*	*30*	*40*	*50*
1	90.0	80.0	70.0	60.0	50.0
2	90.0	80.0	70.0	*60.0*	*50.0*
3	90.0	80.0	*70.0*	50.0	33.5
4	90.0	80.0	58.0	37.5	25.0
5	90.0	*80.0*	47.0	30.0	20.0
6	90.0	66.5	39.0	30.0	16.5
7	90.0	57.0	33.5	25.0	14.0
8	90.0	50.0	29.0	21.5	12.5
9	90.0	41.5	26.0	19.0	11.0
10	*90.0*	40.0	23.5	16.5	10.0

CONTINUED ON PAGE 294

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The values above the italic figures (for N less than CN), were computed by formula (2); the values below the italic figures (for N greater than CN) were computed by formula (3). Machine utilization for values of K ranging between 0 and 1 may be computed from the above tables by interpolation.

Once tables and formulas for machine utilization have been compiled, economic machine assignments may readily be determined. Fomula (4) below gives the cost per machine-hour of output for machine batteries of various sizes:

$$(4)\quad C = \left(M + \frac{L}{N}\right) \div U$$

where C = cost per net machine-hour in dollars
M = Machine-hour cost in cents
L = Labor cost per hour in cents
N = Size of machine battery
U = Net machine utilization in percent as determined by Tables I and II.

Take, for example, a machine operation in which downtime is 20 percent, machine hour rate is $2, the labor cost per hour is $1, and the synchronization is estimated at 1.0. The cost per machine hour of output would be computed as follows:

TABLE III

Size of battery	*Computations*	*Cost per net machine hour*
1	$\left(200 + \frac{100}{1}\right)/80$	$3.75
2	$\left(200 + \frac{100}{2}\right)/77$	3.25
3	$\left(200 + \frac{100}{3}\right)/74$	*3.15* *Most Economical*
4	$\left(200 + \frac{100}{4}\right)/71$	3.17
5	$\left(200 + \frac{100}{5}\right)/69$	3.19
6	$\left(200 + \frac{100}{6}\right)/66.5$	3.26
7	$\left(200 + \frac{100}{7}\right)/57$	3.75
8	$\left(200 + \frac{100}{8}\right)/50$	4.24
9	$\left(200 + \frac{100}{9}\right)/44.5$	4.74
10	$\left(200 + \frac{100}{10}\right)/40$	5.25

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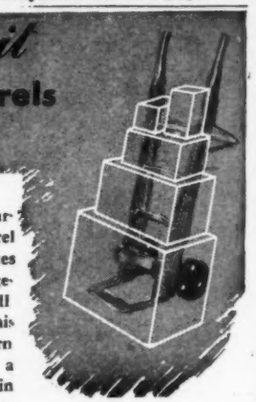

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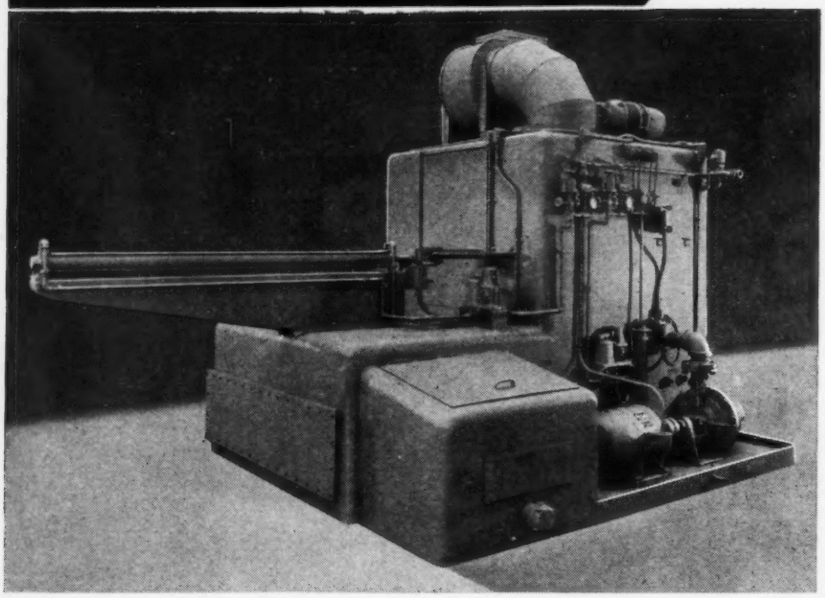

No. 346 New automatic cylinder block Wash, Rinse and Dry Machine

Howard Engineers have built hundreds of machines for the cleaning and finishing of parts formerly done "by hand". Nothing is so expensive as "hand" operations —nothing is so in-expensive as a machine that eliminates "hand" work. HOWARD has an enviable record of solving "can't-be-done" jobs. Illustrated is but one example: a machine that automatically washes, rinses and dries automotive cylinder blocks. Powerful sprays and blasts of air do the job on the intricate part quickly—saving many times the cost of the machine in a single year. Consult Howard Engineers now on that "can't-be-done" problem of yours.

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MACHINERY FOR

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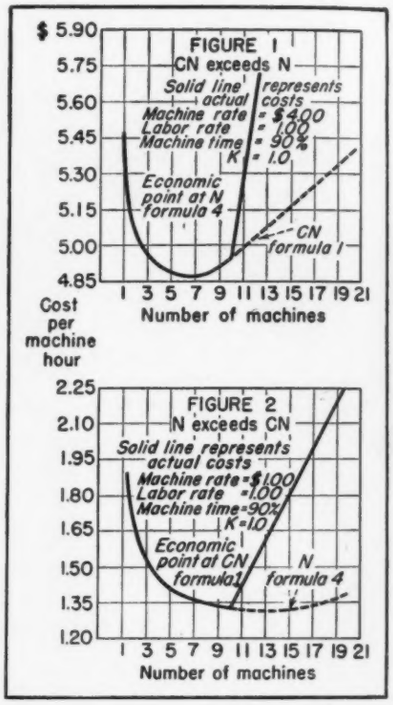
of machines as shown above. However, it might prove practical to assign only two machines to an operator at the slightly higher cost for the conditions given above since it is considerably easier for an operator to tend two rather than three machines. The few extra cents' cost may be more than compensated for by a gain in operator good will. Notice that the standard formula $\left(N=\frac{100}{D}\right)$ which does not take interference into account gives a value of 5 machines, a battery which is less economical than a 3-machine battery and much more difficult to tend.



To see this more clearly, consult Figures 1 and 2. Figure 1 represents the cost per machine hours for conditions where *N* is smaller than *CN*; Figure 2 represents costs per machine hour where *CN* is smaller than *N*.

Machine interference, machine hour rates, and labor costs, when taken into account, greatly increase the complexity of computing economic machine batteries. However, the gains both in lower costs and in better employee relations which are often made possible by accurate determination of economic machine loads are worth the additional effort required.

Formulas for determining interference and for computing economical machine loads provide convenient short cuts. In computing machine interference, however, it is necessary to keep *Critical N* firmly in mind, as that value marks the ranges in which two different sets of formulas are applicable.